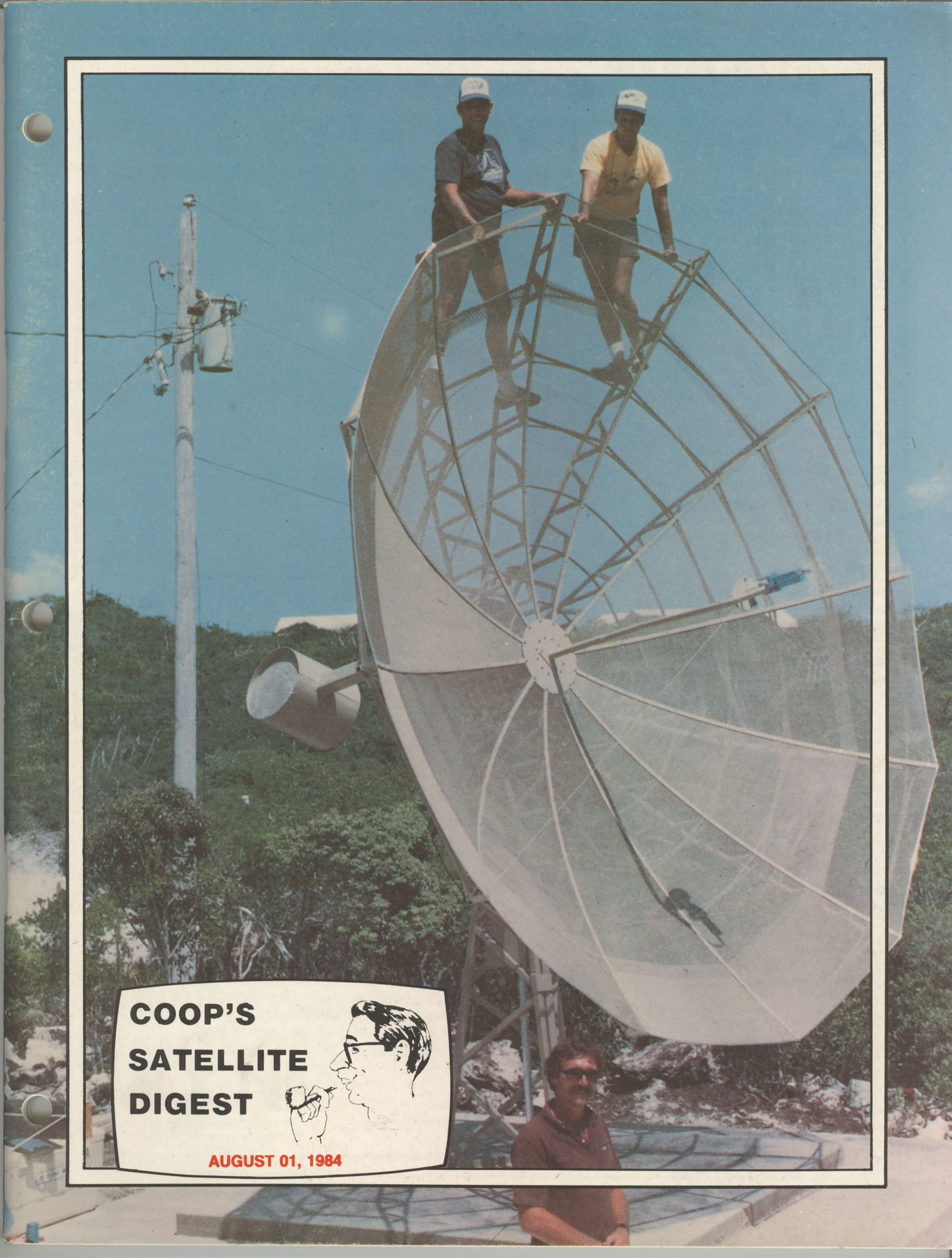

COOP'S SATELLITE DIGEST

AUGUST 01, 1984

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- Remote control console
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- Unclamped video output for decoders

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TOP OF THE MONTH

VERY EXCITING would describe the mental state forming for the September 3-5 'bash' in Nashville. More than 500 booths, forecasts of 10,000 in attendance, a temporary halt if not an 'end' to the divisive trade-show wars between STTI and SPACE. The almost-here giant trade show of the year has all of the elements for success.

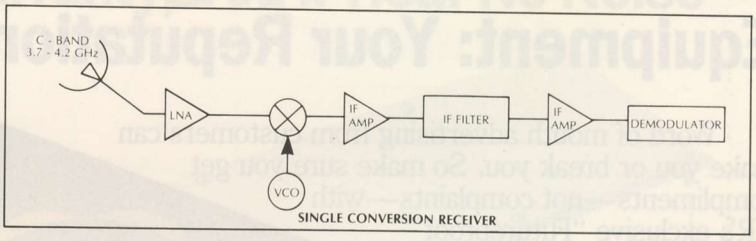
TVRO receiver design, an art that many believe is close to its final form, gets our attention this month. Terry Hinkle of RF Monolithics (Inc.) shows us there are performance differences between single conversion, dual-conversion and block downconversion receiving systems. Good stuff.

Mark Lewis updates us on the fast changing Canadian programming industry with the suggestion that there may be considerably more 4 GHz video from Canada, shortly.

In our continuing series we look at the CATV distribution plant, and, 'puddles' created by North American Domsat birds when they are utilizing spot-beam patterns. Yes, F3R service **is available** in Tahiti.

Coop comments this month on the forthcoming SPACE elections, and explains his position regarding the nomination process. A modest surprise there.

AUGUST 1984



SINGLE CONVERSION RECEIVER

OUR COVER/ 'Number 1-A'. Paraclipse 16 foot horizon to horizon dish. Number '1' went to NASA, '2' to Arthur C. Clarke (see **CSD,** January 1984). Now in full production, the 'A' series came to the Providenciales test range late in June for a critical evaluation. A full report in the September 1st edition of CSD. Paradigm's **Frank Casten** (left), **Gene Campbell** (right) demonstrate the rigidity of the system for **David Ward** (front).

COOP'S SATELLITE DIGEST

COOP'S SATELLITE DIGEST published monthly by West Indies Video, Ltd.; a Turks & Caicos Corporation with corporate offices located at Grace Bay, Providenciales, Turks & Caicos Islands (West Indies) U.S. offices are maintained at Ft. Lauderdale, Florida. All mail including subscriptions, advertising inquiries, reports and letters should be addressed to CSD, P.O. Box 100858, Ft. Lauderdale, FL 33310. CSD office hours in Ft. Lauderdale are Monday-Friday 9:00 AM to 4:00 PM. Telephone (305) 771-0505. CSD is mailed worldwide on or before the 1st of each month, first-class (airmail). Annual subscription rates are $50 (US funds) for USA, Canada, Mexico; $75 (US funds) elsewhere.

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BR Satellite is the only distributor in this industry who will replace any defective TVRO product with a new unit, just by making one toll-free phone call. ***Before*** *you send the defective unit back and at* ***no*** *cost to you.*

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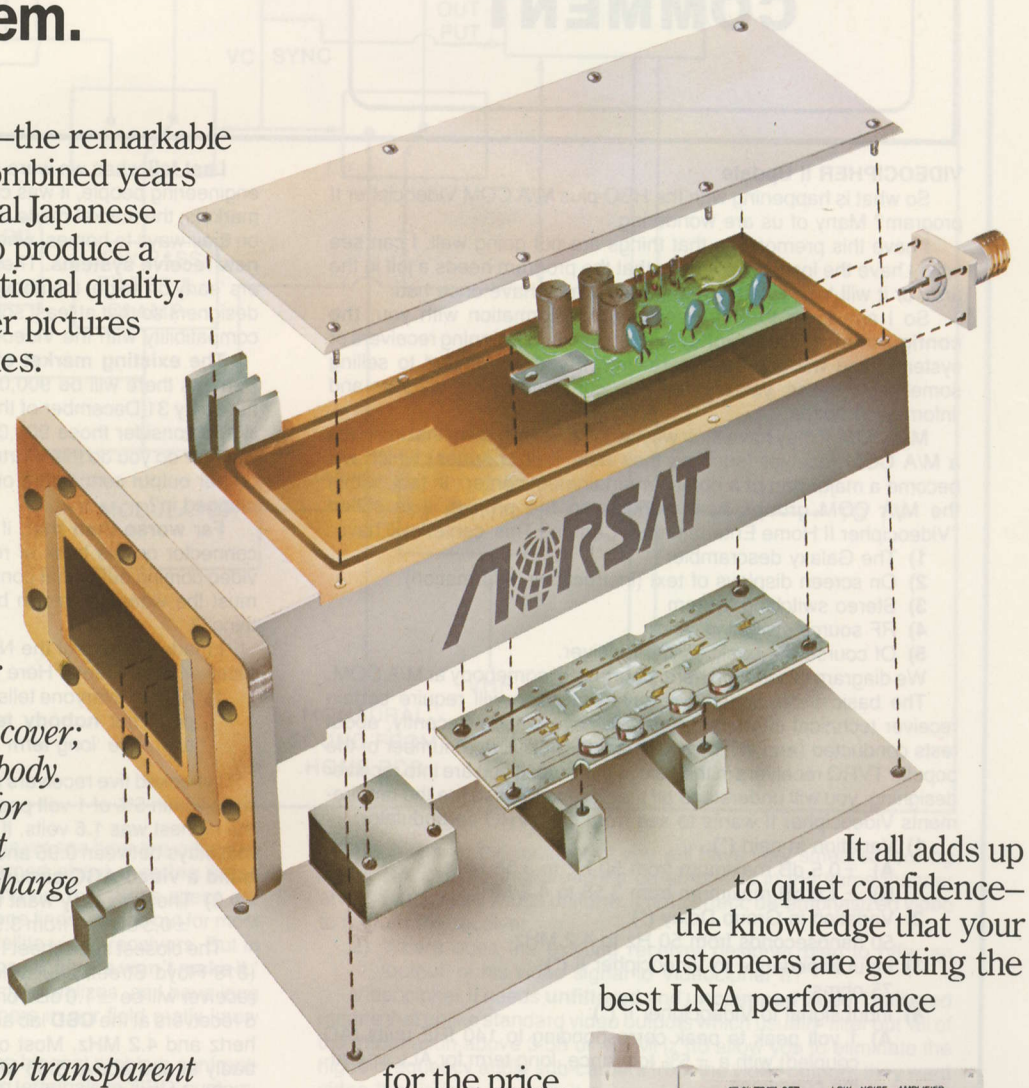

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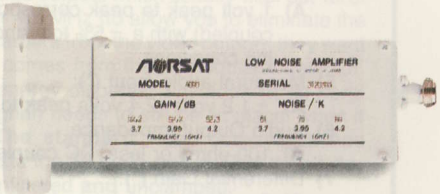

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COOP'S SATELLITE COMMENT

- **DOING The Right Thing**
- **LINK-A-Bit Detail**
- **RECEIVER Testing Pitfalls**

VIDEOCIPHER II Update

So what is happening with the HBO plus M/A COM Videocipher II program? Many of us are wondering.

I have this premonition that things are not going well. I can see why. I have the instinctive feeling that the program needs a jolt in the arm, or it will lose whatever credibility it may have once had.

So I am going to share some hard information with you; **the configuration of Videocipher II.** If you are into designing receivers or systems, you will find this interesting. If you are limited to selling somebody's boxes, you may be very confused by the diagram and 'information boxes.'

M/A COM, if they have their way, will market a system that includes a M/A COM receiver (such as their new T or H series) which will become a major part of a home 'entertainment center.' In fact, within the M/A COM groups now working on the project, it is called "Videocipher II Home Entertainment Center." This 'center' will have:

1) The Galaxy descrambler
2) On screen displays of text (instructions, information)
3) Stereo switching system
4) RF source switching, and,
5) Of course the basic TVRO receiver.

We diagram this for you here, courtesy of somebody at M/A COM.

The basic Videocipher II receiver interface will require certain receiver technical characteristics. We have written, recently, about tests conducted (and still being conducted) utilizing a number of the popular TVRO receivers in the field at this time. If you are into receiver designing, you will understand all that follows. These are the requirements Videocipher II wants to see from the TVRO demodulator:

1) Variation in gain **(*)**:
   A) ±0.5 dB maximum from 50 Hz to 3.58 MHz
   B) ±1.0 dB maximum from 3.58 to 4.2 MHz
2) Variation in Group Delay **(*)**:
   50 nanoseconds from 50 Hz to 4.2 MHz
3) Input impedance to Videocipher II **(*)**:
   75 ohms
4) Input signal to Videocipher II **(*)**:
   A) 1 volt peak to peak corresponding to 140 IRE units (AC coupled) with a ±5% tolerance, long term for ALL operating conditions
5) Monaural audio input **(*)**:
   A) ±1.2 volts (2.4 volts peak to peak)
6) Audio Output Impedance:
   A) 100 ohms or less, DC coupled
7) Differential Gain **(*)**:
   A) 5 percent, peak to peak maximum
8) Differential Phase **(*)**:
   A) 4 degrees maximum, peak to peak variation
9) Short Time Distortion **(*)**:
   A) 2T test / ± 2.5% maximum
   B) Bar(s) edge / 5% peak to peak maximum.

Now, if you are NOT closely attuned to the technical side of a video demodulator circuit, what does all of this mean? Trouble with a capital T.

***/ at input to Videocipher II.**

Last fall when we were discussing this privately with some HBO engineering people, it was clear to me at that time they saw a **pair** of markets; the market made up of the **existing receivers,** in homes or on their ways to homes, when 'CBD' was finally announced, and, the **new receive systems.** They hoped, by talking with receiver designers 'early on' to get the above technical points 'across' to the receiver designers so that at least some of the receivers would have technical compatibility with the Videocipher II box when it became available.

The existing market of course grows larger by the month. Perhaps there will be 900,000 terminals in use or at least in dealer hands by 31 December of this winter. Perhaps. Naturally HBO would like to consider those 900,000 homes for Videocipher II "add-ons." But how do you do this if virtually none of the receivers even have the proper output connectors on them to allow the Videocipher II to be plugged in?

Far worse than that, if you could figure out **how** to get a new connector on the back of receivers, what about the 'quality' of the video coming out of that connector? Just how close to these numbers must the video waveform be, to allow the Videocipher II to "do its thing"?

I made a round of the Niagara Falls booths picking up the latest receiver data sheets. Here is what I found:

1) Almost everyone tells you the video output will be 1 volt peak to peak but **nobody tells you** about 140 IRE units or ±5% tolerance 'long term under all operating conditions.'

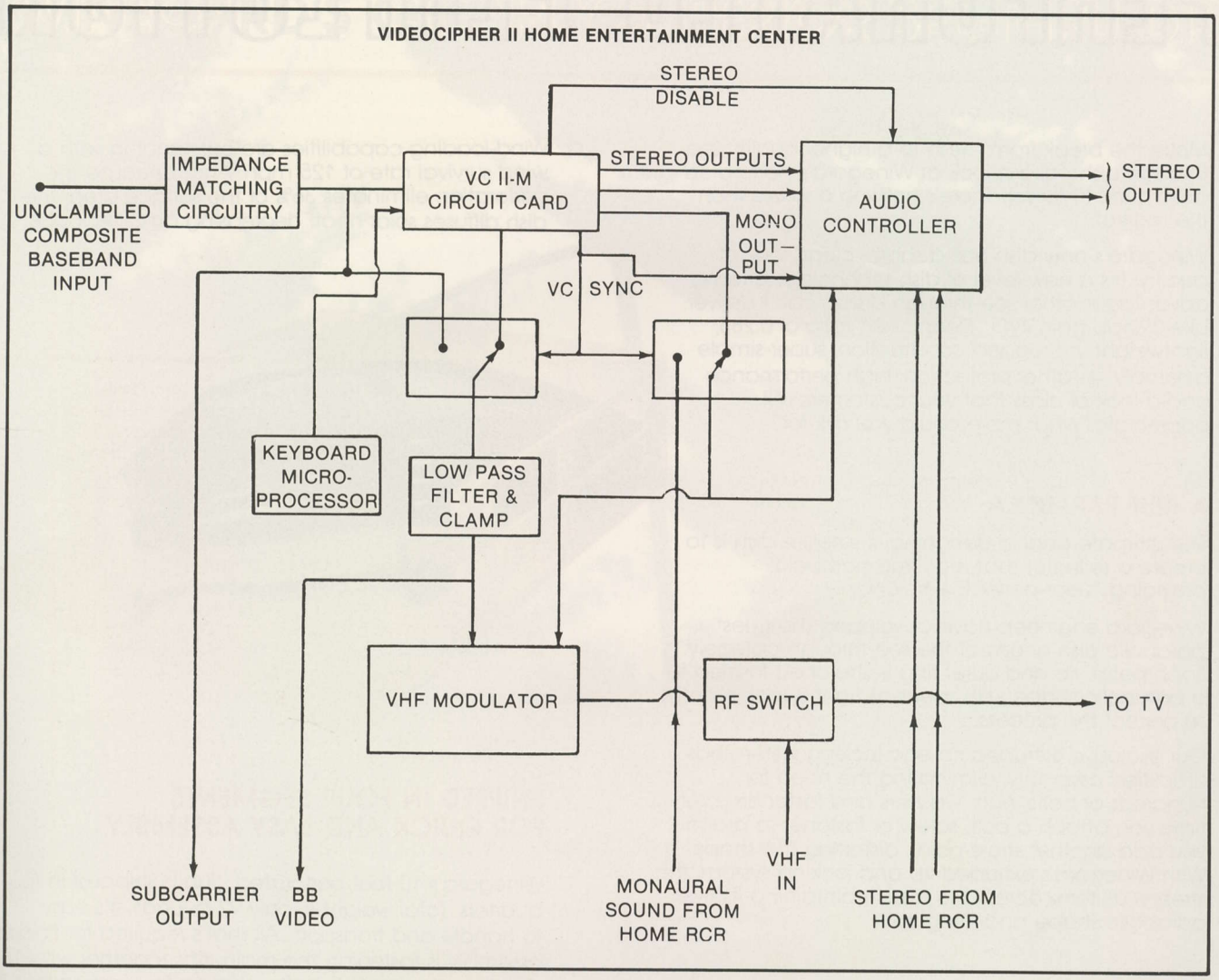
I checked five receivers at the **CSD** Lab on Provo and found **none** were within 5% of 1 volt peak to peak. The lowest was 0.55 volts and the highest was 1.6 volts. If Videocipher II really needs a video input that stays between 0.95 and 1.05 volts all of the time, **I suggest they build a video AGC circuit into it!**

2) They say they want the gain from 50 hertz to 3.58 MHz to be ±0.5 dB and from 3.58 to 4.2 MHz, they want it to be ±1.0 dB.

The closest spec sheet I found came from the **Stead Corporation** (818 Floyd Street, Louisville, Ky 40203) and they claim their 110-S receiver will be ±1.0 dB from 15 hertz to 4.2 MHz. I checked the same 5 receivers at the **CSD** lab and found variations up to 7 dB between 50 hertz and 4.2 MHz. Most of them roll off (i.e. lose) video response badly at and above 3.58 MHz. Trouble? **With a capital 'T.'**

3) And they say they want group delay to be under 50 nanoseconds from 50 hertz to 4.2 MHz. I didn't locate **any** receiver data sheet that specifies group delay, until I got back home and located a Microdyne and S/A set of folders. Neither number is impossible, by Microdyne or S/A specs. **But first** we are going to have to teach our present manufacturers what it is, and how to measure it!
4) They ask for differential gain to be 5% maximum, peak to peak. Again, the Stead 110-S claims a ±2.5% maximum (or 5% overall). Virtually nobody else bothers to **spec** it; and I suggest they probably also do not **measure** it.
5) They want differential phase to be 4 degrees maximum. Stead's 110-S claims +/**2%** (I'm sure they meant **degrees** and not percent), and many others disregard it.

I talked about the Videocipher II requirements with the engineer whom I consider to be the **best** in our business; **Daniel Bernasi** of **Scanner Satellite Systems** (P.O. Box 571, Massena, New York



13662). Most of the 'problems' or "T"rouble we see here are video fine tuning problems. Daniel was not concerned about **meeting** these numbers with his own equipment, pointing out that these specs are really somewhat relaxed from the specs one finds spelled out for most of the high grade (as in commercial) satellite video receivers. But in our field, Bernasi feels, **'the majority of the receivers won't make it.'** His is not a self serving statement; he simply realizes, as I have long suspected, that very few receiver designers in our field really know their way around video circuit design.

I think HBO **now realizes** this; that the biggest problem confronting them with 'converting' all of the existing terminals to 'CBD' customers is not finding dealers who can retrofit some parts into an existing receiver, but, in dealing with receivers which no quantity of 'parts' will make 'CBD' compatible.

I would not be surprised to see HBO simply **'write off'** converting existing receivers to CBD service. **And that** will make a major difference in their marketing plans.

HBO, in making the rounds and talking with receiver OEMs, had a number of questions it posed to designers.

1) If it **were possible** to convert existing receivers, would it be better to 'ignore' the existing receiver de-emphasis circuit and build a standard de-emphasis network into each Videocipher II box?

De-emphasis is a system used to reconstruct the video to its uplink-original form. To 'spread' the picture information out more evenly over the full transponder, the uplink transmitter uses something called '**pre**-emphasis.' You have to reverse this process, with **de**-emphasis, at the receiver or you will have very smeared looking video. Not everyone approaches de-emphasis in the same manner and Videocipher II wants uniform, if not perfect, de-emphasized video to it, from the receiver.

2) Where does the existing receiver designer plan to offer an 'output' of his video signal to Videocipher II?

Videocipher II needs **unfiltered** and **unclamped** video. Unfiltered means that unlike standard video outputs which usually 'filter out' all of the information above 3.58 or 4.2 MHz (to allow you to eliminate the higher frequency audio sub-carriers from the video output), they want video that is 'raw,' just as it comes from the demodulator/detector. Unclamped means that the energy dispersal waveform (a 30 hertz signal added to the uplink signal) needs to still be 'in place' when it goes into Videocipher II. **The standard** video output jack has 'clamped' the video to eliminate the 30 hertz signal. **That won't do;** the output, again, must be unfiltered **and** unclamped.

HBO accepts that in almost all cases, the installer would have to go inside the receiver and find the spot where the video is **not filtered** and **not clamped;** and then route that point through a 75 ohm 1 volt peak to peak AC coupled network to the Videocipher II. How many receivers can do this, the other video-parameters forgotten for now? Unknown.

HBO has another plan. Suppose they find that our video engineering is so bad, and so non-uniform, that there is simply no

COOP/ continues on page 59

PERFORATED PERFECTION

Make the break from mesh to a higher quality see-through dish. Take a look at Winegard's perforated aluminum 10-footer. There's nothing else like it on the market.

Winegard's new dish has a sharp, clean look of quality. It's a new level of dish technology offering advantages other see-through dishes can't deliver. Like 39.5db gain, F/D "Deep Dish" ratio of 0.283, lightweight yet rugged construction, super-simple assembly, weather protection, high performance and a look of class that your customers will appreciate. What more could you ask for?

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The ultimate goal in designing a satellite dish is to create a reflector that is a "true parabola" - providing "near-perfect" efficiency.

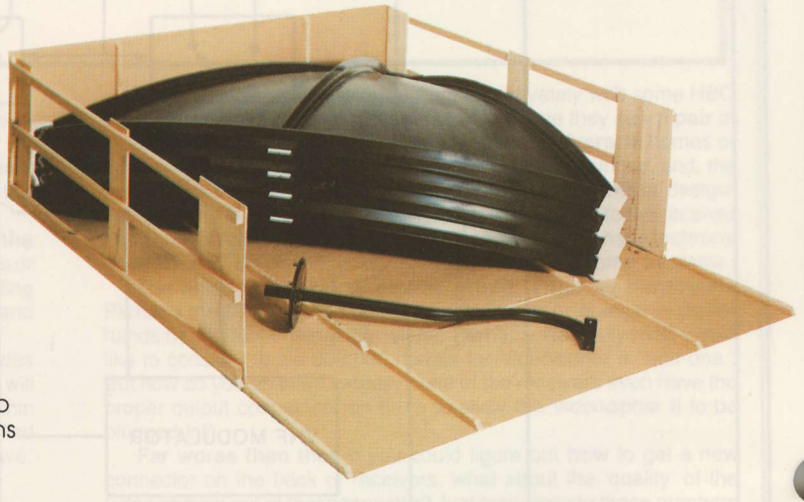
Winegard engineers have developed the truest parabolic dish of any of the see-through category. Each petal, rib and outer ring is stretched-formed to a parabolic shape with specs so tight it took months to perfect the process.

Our exclusive extruded rib and locking system has simplified assembly, eliminating the need for hundreds of bolts, nuts, washers and fasteners. Every time you attach a bolt, screw or fastener to a dish you add another stress point, distorting the shape. With Winegard's extruded rib and locking system, the stress is uniform across the dish, maintaining its true parabolic shape and integrity.

LIGHTWEIGHT BUT RIGID PERFORATED ALUMINUM

Not only is the Winegard perforated aluminum dish lightweight and easy to handle, but it is extremely rugged, durable and well constructed. You can actually see through the perforated petals which are constructed of .040-gauge anodized aluminum. The extruded aluminum main ribs, which provide the basic structural support, are 1/8" thick. The locking ribs are .070" thick and lock the perforated aluminum petals tightly in place. A double-walled outer rim provides an area to insert rim splices at all joints for perfect alignment and additional strength.

Wind-loading capabilities are outstanding with a wind survival rate of 125 mph. And, because the perforation eliminates 36% of the surface area, the dish diffuses solar heat, decreasing amplifier noise.



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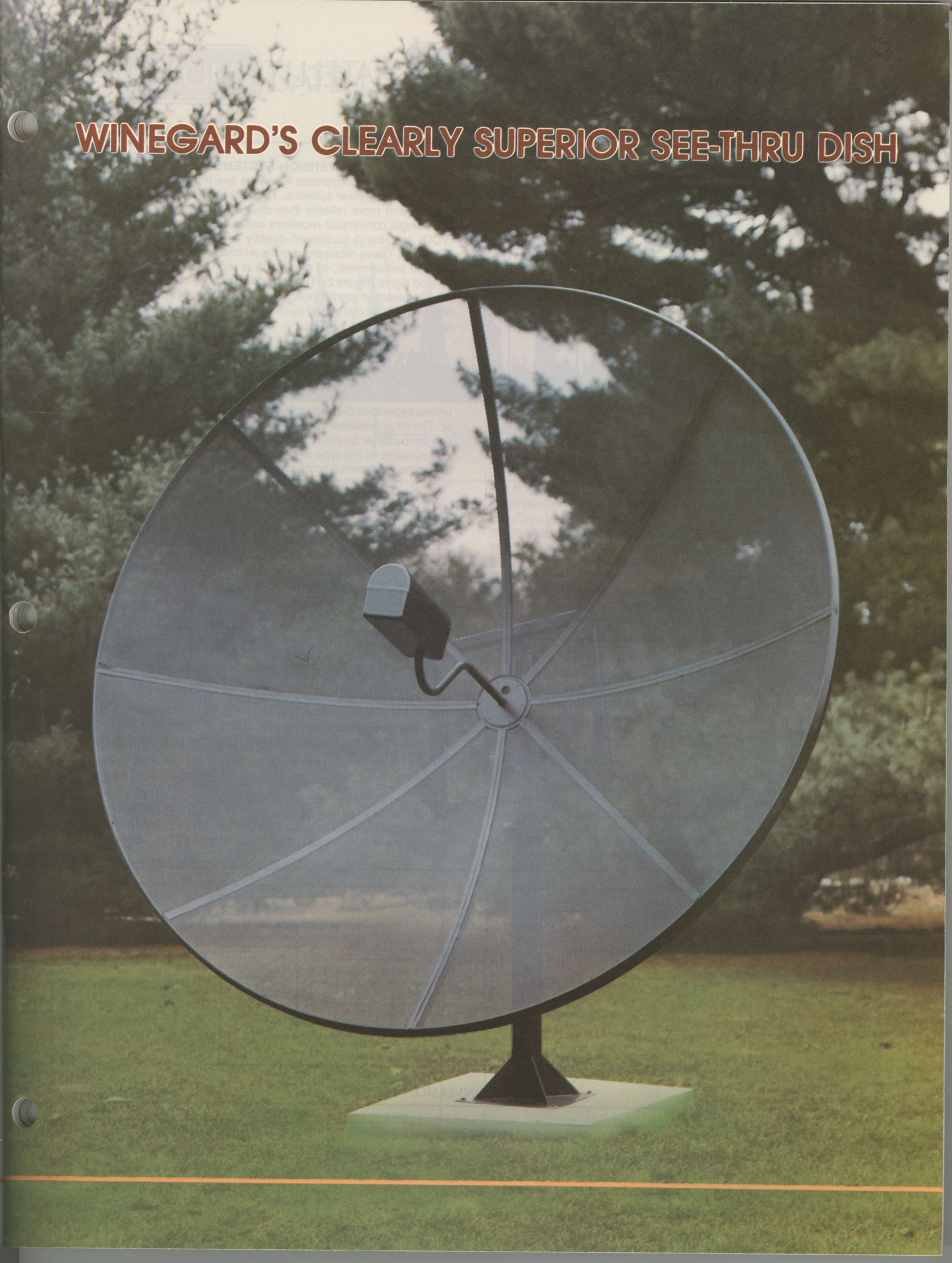
WINEGARD'S CLEARLY SUPERIOR SEE-THRU DISH

UNDERSTANDING TVRO RECEIVER DESIGN

INTRODUCTION

Current satellite TVRO receiver configurations can be categorized as single downconversion, dual downconversion or block downconversion. In most cases, the receiver intermediate frequency choices were based on available filter components and FM detectors. These components were readily available at 70 MHz from military and terrestrial receiver systems. The recent advance in component technology has increased the economical high frequency limit of such key components as filters, amplifiers, oscillators, and FM detection circuits into the upper UHF band. As a direct result, a cost effective system's engineering approach can now be applied to TVRO receiver design and development. Each receiver category is discussed in terms of the best system performance and lowest manufacturing cost using state of the art components. Cost and performance tradeoffs are then made between existing TVRO systems and the proposed system in each receiver category.

Editor's Note:
Basic receiver design confuses many. Single conversion, dual or double conversion and block down conversion are all common terms little understood by the typical dealer. Hinkle describes each and lays the ground work so that you will better comprehend receiver design-differences when faced with a purchasing decision.

by
Terry Hinkle
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RFMonolithics, Inc. (RFMI)
4441 Sigma Road
Dallas, Texas 75234
(214/233-2903)

SINGLE DOWNCONVERSION SYSTEMS

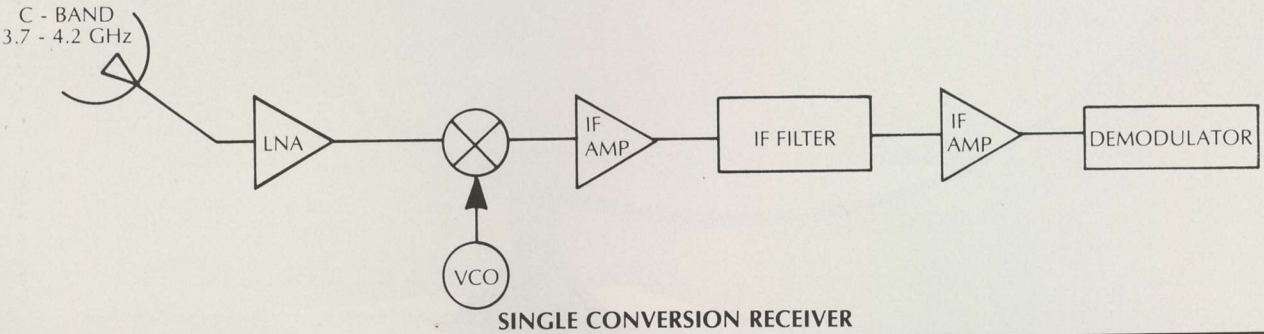
TVRO single conversion receivers are the most widely used in TVRO home receiver systems. These receivers are usually less expensive and more reliable than dual or block conversion systems. Most single conversion receivers use a voltage controlled oscillator (VCO) at C-band to convert directly to 70 MHz for demodulation **(figure 1).** These receivers require an image reject mixer at 4 GHz in order to perform well, as the image is only 140 MHz away from the desired signal **(figure 2).** These special purpose mixers provide 20-25 dB of unwanted signal rejection **when done properly.** They are, however, costly compared to other mixers commonly used in 4 GHz receivers.

Single conversion receivers going directly to 70 MHz have performance limitations when used in a multiple receiver installation. Any hookup requiring simultaneous reception of more than 1 channel from the same antenna will not have all channels available to both receivers unless expensive C-band isolation equipment is used on each receiver. The local oscillator from one receiver will interfere with the reception on the other as shown in Figure 2. Many times completely separate systems of this type with antennas in close proximity can suffer the same interference problems when the 4 GHz LO signal from one leaks or radiates into the other.

Performance degradation can also come from television signals and various other sources of interference existing between 60 and 80 MHz. These extraneous signals leak into downconverter boxes or can be picked up in the coaxial cable spanning between the antenna and the receiver. This type of interference **cannot be filtered out** as it is within the band of the desired signal.

If, however, a single conversion receiver has an intermediate frequency (IF) high enough to cause the image frequency to fall out of the satellite band, the costly image reject mixer is not required. If the IF is also high enough to cause the LO signal to always be out of the desired band, there would be no need for C-band isolators in multiple receiver configurations. Choosing a little used part of the spectrum would help eliminate the IF leakage problem. The first two conditions require the IF to be greater than 500 MHz. The high frequency limit for choosing an IF comes from the cost of amplification, cable losses, and FM demodulation limitations. All things considered, **a good choice** for this IF is 612 MHz.

For a C-band single conversion receiver with an IF at 612 MHz and a low side LO, the image falls between 2446 MHz and 2946 MHz. The LO for this receiver tunes between 3058 MHz and 3558 MHz **(figure 3).** The local oscillator is well below the first desired satellite transponder and the image response can be eliminated by broadband filtering



SINGLE CONVERSION RECEIVER

FIGURE 1

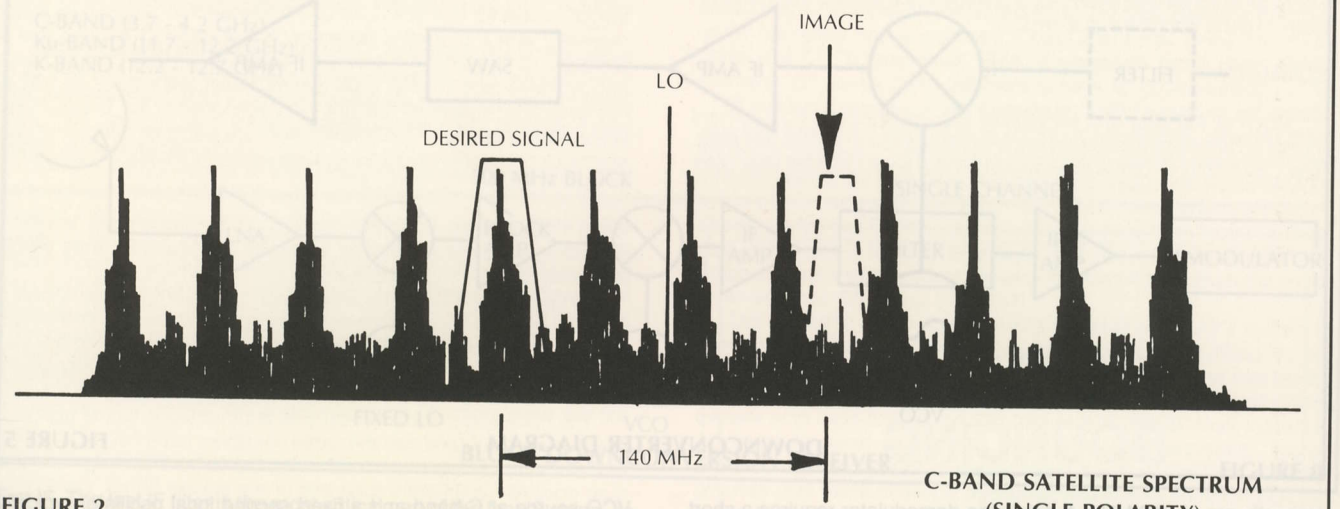


FIGURE 2 C-BAND SATELLITE SPECTRUM (SINGLE POLARITY)

at the input of the downconverter. High side LO injection offers an even better scheme, as the image frequency will occur from 4.95 GHz to 5.45 GHz **(figure 4).** This approach would take advantage of the LNA's out of band response (or lack of) to provide the image attenuation.

A block diagram of the downconverter section of a C-band single conversion receiver with a 612 MHz IF is shown in **figure 5.** VCO's are available from Avantek or Watkins Johnson and are the same as those presently used in many single and dual conversion systems. The mixer is a standard product available from Mini Circuits for less than $10. The amplifiers used here are off-the-shelf components available from NEC or Avantek for about $4 each. The SAW filter is a standard product available from RFMonolithics, Inc. It has 31 MHz of bandwidth for best system performance in an outside temperature environment.

An important consideration at higher IF frequencies is the cable attenuation between the **downconverter** and the receiver. At 612 MHz, RG-6 cable has losses in the 6 dB per hundred feet range. The same cable at 70 MHz only loses 2 dB per hundred feet. This extra cable loss is simply compensated with gain at approximately $0.20/dB. A summary of these tradeoffs is shown in Table 1.

In the receiver, gain and AGC circuitry are inexpensive at both 612 and 70 MHz. Filters are available at both 70 MHz and 612 MHz with good performance; but low-loss, high-performance SAW filters are **only available** at 612 MHz. Discrete filters are much larger and typically cost more in production due to the tuning required. High loss 70 MHz SAW filters are somewhat larger, **require far more IF gain,** and have marginal amplitude and phase performance when inserted in most printed circuit board layouts.

DOWN CONVERTER COMPARISONS	70 MHz	612 MHz
MIXER COST[1]	$14.00	$4.00
AMPLIFIER COST (24 db)	$0.20/db $2.40	$0.20/db $2.40
CABLE LOSS CABLE COST[2]	2db/100' $10.00	6db/100' $11.60[3]
	$26.40	$18.00

1. Image reject mixer @ 70 MHz.
2. Assume 200' run RG-6 cable.
3. At 612 MHz $1.60 of amplification to make up 8db of cable loss.

TABLE 1

The last thing to be considered is FM demodulation at high IF's. Both phase locked loops and delay line discriminators are presently being used in volume at frequencies above 550 MHz and many

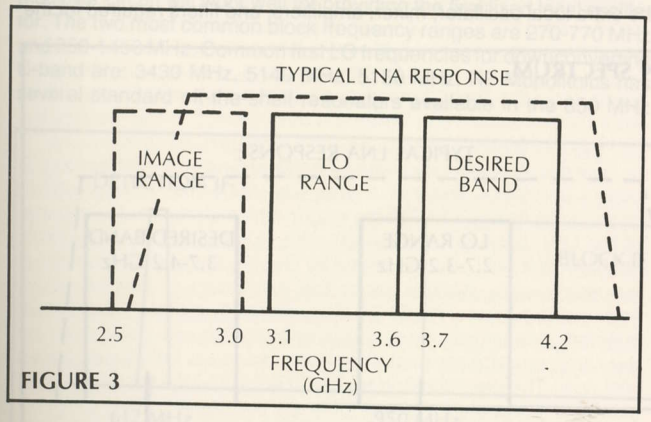


FIGURE 3 SINGLE CONVERSION SPECTRUM (LOW SIDE LO)

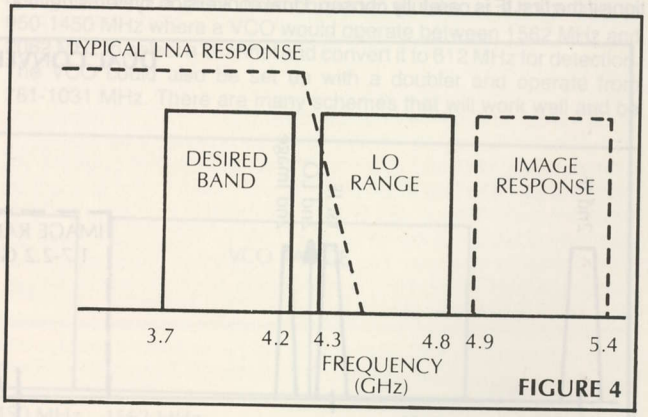
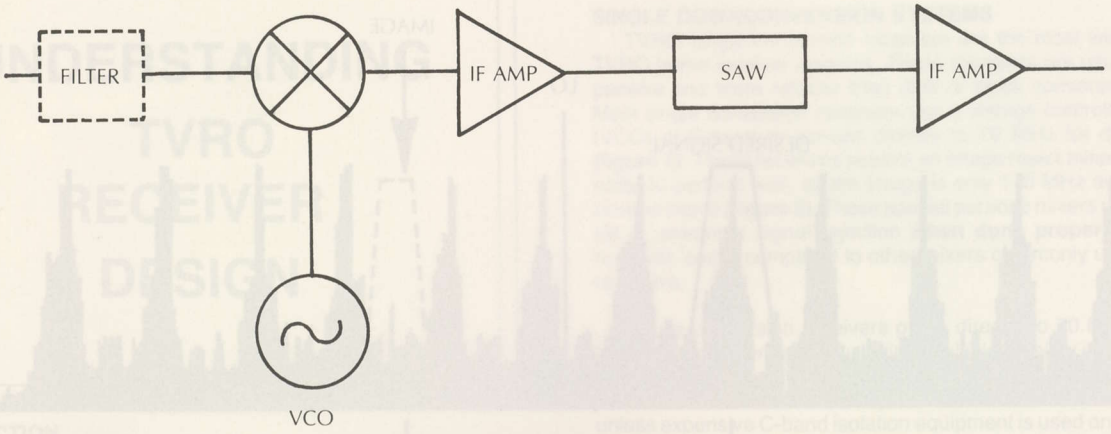


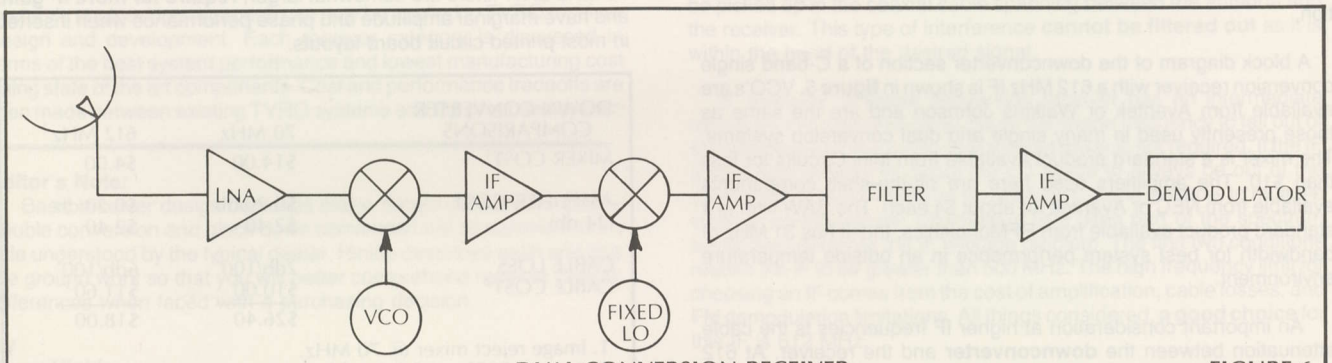
FIGURE 4 SINGLE CONVERSION SPECTRUM (HIGH SIDE LO)



DOWNCONVERTER DIAGRAM FIGURE 5

currently are at 612 MHz. A delay line demodulator requires a short length of cable, a $3 mixer and a simple low pass filter. Phase lock loops are somewhat more complex but they are currently working well in high volume production at 612 MHz.

DUAL DOWNCONVERSION SYSTEMS



DUAL CONVERSION RECEIVER FIGURE 6

Currently many of the **best performing** TVRO systems have two frequency conversions before demodulation. This is done primarily to eliminate image problems found in some of the single conversion systems previously discussed. This type of receiver can also eliminate local oscillator interference problems in multiple receiver configurations if the first IF is carefully chosen. Dual conversion systems have a VCO source at C-band and a fixed second local oscillator typically around 1 GHz. This allows the first image response and VCO to be placed away from the desired C-band signals **(Figure 7).**

There can be problems with spurious signals in this type of receiver system. If harmonics from the second local oscillator (typically the third harmonic) get into the image of the desired band, the receiver can suffer strong enough interference to completely eliminate reception in a given channel. This problem can be eliminated by using an upper side VCO or by proper choice of the second local oscillator.

Dual conversion systems have added cost and complexity due to the extra local oscillator, mixer, amplifiers, and filters required for the

DUAL CONVERSION SPECTRUM

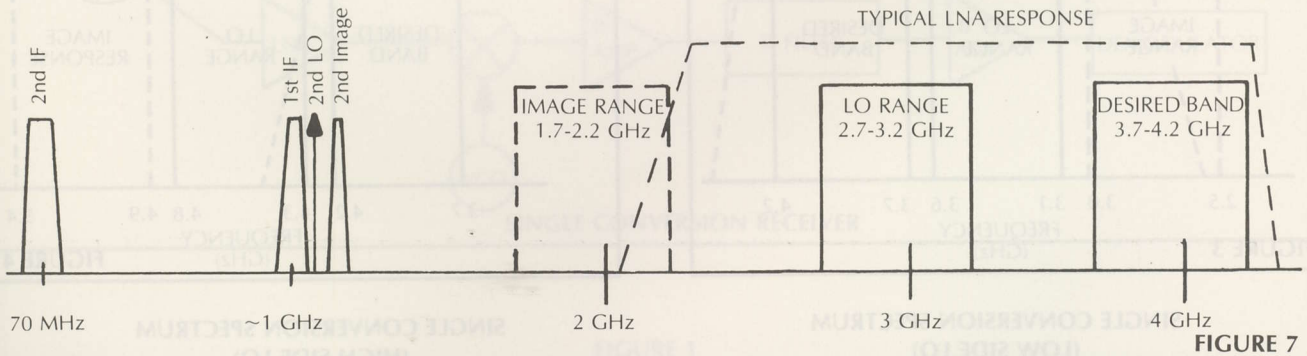
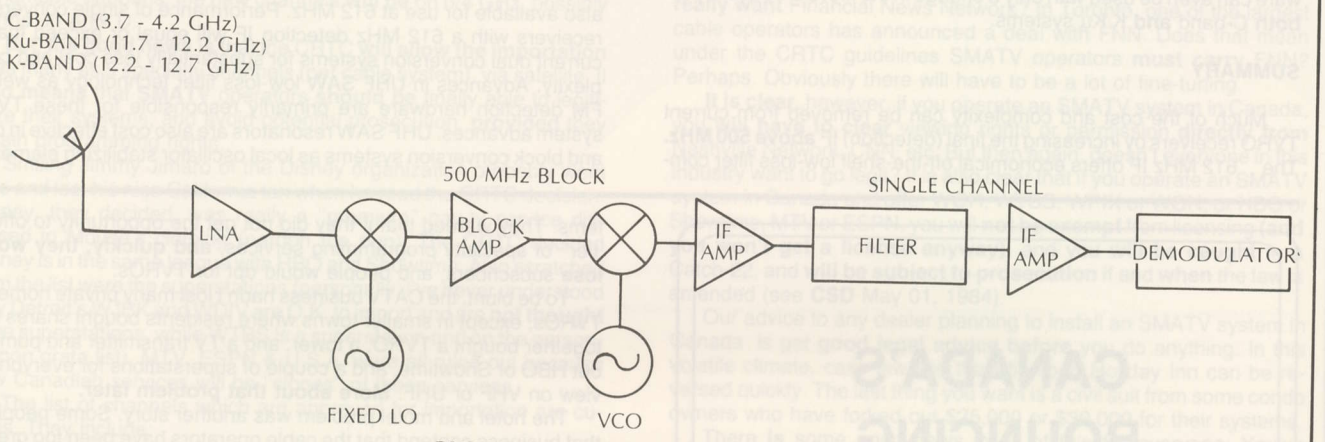


FIGURE 7



BLOCK DOWNCONVERSION RECEIVER **FIGURE 8**

first IF. The first IF filter is the most critical part of the first IF string, as poor selectivity here will result in the same image problems found in single conversion systems going directly to 70 MHz.

Dual conversion systems can also suffer more frequency control accuracy problems than single conversion systems. The combined accuracy of both local oscillators over time and temperature is often twice as bad as is found in single conversion systems. Problems with the second LO stability can be economically eliminated by using a UHF SAW resonator based oscillator. A SAW resonator stabilized oscillator in the 800 MHz range will stay within ±70 KHz of nominal center frequency over a temperature range of −35C to +70C. Quartz SAW resonators also provide good long term stability holding an 800 MHz source within 4 KHz over a year.

BLOCK DOWNCONVERSION SYSTEMS

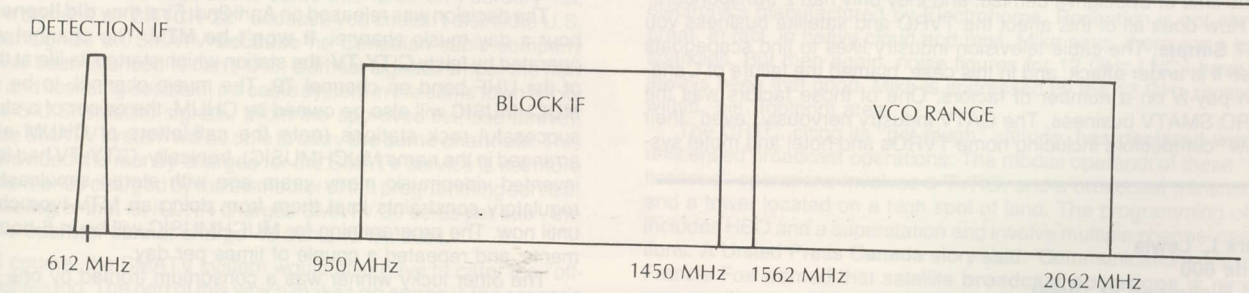
Another type of dual conversion receiver converts the entire 500 MHz block from C, Ku or K-band down to some lower IF for further processing. To accomplish this, the first local oscillator is fixed and the second is varied to select individual channels as shown in **Figure 8.**

The fixed local oscillator for block downconversion systems requires enough stability to allow the second local oscillator (VCO) to successfully select a channel. Most systems employ an automatic frequency control function (AFC) to hold the selected channel after it is tuned in. This requires the first LO to be stable enough over temperature and time to allow the VCO and AFC combined to select a single channel and maintain it. A UHF SAW resonator stabilized oscillator and a multiplier circuit will work well for providing the first fixed local oscillator. The two most common block frequency ranges are 270-770 MHz and 950-1450 MHz. Common first LO frequencies for downconverting C-band are: 3430 MHz, 5140 MHz, 5150 MHz. RF Monolithics has several standard off-the-shelf resonators available in the 850 MHz range that will generate these local oscillators with the appropriate multipliers. There are also SAW resonators available at 1028, 1030, and 1143.333 MHz which will also efficiently do the job. These SAW resonators provide stable oscillator control over time and temperature. When used with 4X to 6X multipliers, these SAW resonator oscillators provide stable LO's for C-band block converters.

Block downconversion systems provide excellent performance if the second IF is chosen above 500 MHz and an upper side VCO is used. For this case both image and LO signal fall out of the desired band **(Figure 9).** Other common block frequencies include 270-770 MHz with a 230 MHz IF and 950-1450 MHz with a 300 MHz IF. However, both of these systems have the LO falling within the 500 MHz band for **some channels** making multiple receiver installations more costly.

The high frequency block downconversion systems (950-1450 MHz) **can be** interference free on all channels, **with the proper choice of detection IF.** Even though gain is somewhat more expensive and the cable losses are more than in the 270-770 MHz band, it is worthwhile to go up to the high block IF for commercial grade C-band systems as most systems have more than one receiver connected to a single downconverter.

A key advantage of the block downconversion systems is the VCO operates at a lower frequency than in conventional single channel systems. This is especially important in the K/Ku band equipment (such as that used for DBS systems) where the downlink frequencies are at 12 GHz. Some receivers for the upcoming DBS systems will be configured with a block downconverter to take 11.7-12.2 GHz to 950-1450 MHz where a VCO would operate between 1562 MHz and 2062 MHz to select a channel and convert it to 612 MHz for detection. The VCO could also be set up with a doubler and operate from 781-1031 MHz. There are many schemes that will work well and be



BLOCK DOWNCONVERSION SPECTRUM **FIGURE 9**

cost efficient for these upcoming systems. The same receiver hardware can even be used with only a change in the first LO frequency for **both** C-band **and** K/Ku systems.

SUMMARY

Much of the cost and complexity can be removed from current TVRO receivers by increasing the final (detection) IF **above 500 MHz.** The 612 MHz IF offers economical off-the-shelf low-loss filter components currently available in two bandwidths for TVRO receiver systems (from RF Monolithics Inc.). FM detection components are also available for use at 612 MHz. Performance of single conversion receivers with a 612 MHz detection IF will equal or exceed that of current dual conversion systems for substantially less cost and complexity. Advances in UHF SAW low-loss filter technology as well as FM detection hardware are primarily responsible for these TVRO system advances. UHF SAW resonators are also cost effective in dual and block conversion systems as local oscillator stabilizing elements.

CANADA'S BOUNCING BALL

Things are happening so fast in Canada that it is becoming increasingly difficult to write a report which reflects what is **REALLY** happening. Here are some examples:

First, in what may turn out to be a monumental regulatory decision for the SMATV and TVRO industry, the CRTC (on April 2, 1984) released its long-awaited decision on "specialty services." The issue before the CRTC was basically this: Unlike the situation in the U.S. which is de-regulated, i.e. all you have to do is lease a transponder and do whatever you want such as Bluemax, Weather, baseball, etc., the CRTC has asserted its powers of licensing over pay-tv and now, "specialty" programming. In 1982, the CRTC licensed several pay-tv companies to provide national and regional pay services; First Choice, AIM, C-Channel, Star Channel, Superchannel (Ontario), Superchannel (Alberta), Premier Choix, TVEC, and so on.

By the fall of 1983, just 7 months after launch of services, AIM, Starchannel, and C-Channel had all folded; either bankrupt or in receivership. First Choice required a blood transfusion in the form of millions of dollars of new funds (and new shareholders), and with the money and new owners came new management. Superchannel was marginally more healthy, but still **losing lots of money** every month.

The problems were mainly high transponder costs, few subscribers, and what is known in pay-tv jargon as "churn" (disconnects). To give you an idea of the magnitude of the problem, Superchannel's two costly 12 GHz spot beams were serving **fewer than 200,000 subscribers total!** Contrast this to 12 to 13 million-paying HBO subscribers. We all know what happened to Spotlight, and they had more than twice the subscriber level of **all** Canadian pay-tv channels **combined,** at the time of Spotlight's demise, and they only had 2 transponders.

How does all of this affect the TVRO and satellite business you ask? **Simple.** The cable television industry likes to find scapegoats when it is under attack, and in this case, blamed the failure of Canadian pay-tv on a number of factors. One of those factors was the TVRO/SMATV business. The CATV industry nervously "eyed" their "new" competitors including home TVROs and hotel and motel systems. They warned that if they did not get the opportunity to offer a 'tier" of specialty programming services, **and quickly, they would lose** subscribers, and people would opt for TVROs.

To be blunt, the CATV business hadn't lost many private homes to TVROs, except in smaller towns where residents bought shares and together bought a TVRO, a tower, and a TV transmitter and pumped out HBO or Showtime, and a couple of superstations for everyone to view on VHF or UHF. **More about that problem later.**

The hotel and motel problem was another story. Some people in that business contend that the cable operators have been too greedy in their pricing of basic cable services. Some hotel people have said their business is different than that of the private home. On a given night a certain number of rooms might be empty, so why pay for each room on the same basis as a private home? Apartment and condominium owners, always looking for a deal or a fast buck, looked to the skies for a way out. Most (not all) Canadian apartment owners would rather **swipe than pay,** and see SMATV is a good cheap way to get "free" pay TV to offer their tenants.

All that said, here seemed to be unanimity in the belief that more services packaged with the surviving pay-tv movie channels would make Canadian pay-tv more attractive, and, more viable.

The initial call for applications yielded more than 30 applications for specialty services. The rules established by the CRTC were odd. First, the services had to be **wholly supported** through subscribers' fees. That basically left out most of the types of services on SATCOM and Galaxy; for example, CNN & WTBS & CNN2 are hybrids, and there are subscriber fees **and** commercial advertising.

The CRTC changed its mind somewhat midstream and allowed **some variations** in the means of support for the services. Then a strange thing happened: All sorts of U.S. programmers arrived at the hearing to talk about their plans to serve the vast uncharted areas of Canada. Jimmy Jimaro of the Walt Disney Channel (remember Jimmy and Annette on the Mickey Mouse Club? Same Jimmy!) was most impressive. They had even thought out their own marketing strategy. They would use "800" toll-free phone numbers so that people could order their service directly. The Commissioners loved Walt, and Jimmy, and Mickey, and told them so. Jimmy Jimaro left the hearing smiling; a very happy man.

The hearings lasted weeks, and included Chinese channels, health channels, music channels, public affairs channels, everything imaginable. Some applicants actually "folded" just like in a poker game. One Medical Doctor, applying for a health-oriented channel, just put his head down on the table when the questioning from the CRTC became too much for him to handle, and he saw **his dream** going down the drain. Lots of applications were withdrawn. Others were literally tossed out. When the dust cleared, it was evident that there would be few winners, with the emphasis on **few.**

The decision was released on April 2nd. First they **did license** a 24 hour a day music channel. **It won't be MTV.** The channel will be operated by feisty CITY-TV; the station which started its life at the top of the UHF band on channel 79. The music channel, to be called **MUCHMUSIC** will also be owned by CHUM, the owner of a string of successful rock stations (note the call-letters of CHUM are rearranged in the name MUCHMUSIC). Ironically, CITY-TV had literally invented videomusic many years ago with stereo simulcasts, but regulatory constraints kept them from doing an MTV-type channel until now. The programming for MUCHMUSIC will be in 6-hour segments, and repeated a couple of times per day.

The other lucky winner was a consortium fronted by one of the largest breweries; **Labbats** (brewers of "50," and "Blue") literally **own** sports in Canada. They also own the Blue Jays, a sports club. These

by
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Canada

two channels will be on the "birds" by fall of '84. Unless something remarkable happens, the new channels **will be** on 6/4 GHz, possibly berths on Anik D.

But, **the good news is** that the CRTC **will allow the importation** of as many as 5 specialty channels (per cable system), via satellite. It **also means** that **SMATV** operators **should be** finally able to legitimize their systems, and avoid potential prosecution, **provided** they obtain programming rights.

Smiling Jimmy Jimaro of the Disney organization probably went pale and lost his nice California tan when he read the CRTC decision. Disney, they decided, was really a "premium" pay-tv service disguised in Mouse's clothing (pardon the pun). The CRTC decided Disney is in the same league with HBO and Showtime. Also scratched from the list were the superstations (personally, I've never understood why Detroit's WJBK and WDIV are O.K. to import and are **not thought** to be superstations, while WTBS is a superstation and on the persona non grata list). MTV, ESPN & U.S.A. were all ruled out because new Canadian services will be "clones" of these services.

The list of channels which are approved for importation are curious. They include:

Weather Channel
Learning Channel
CNN & CNN2
Financial News Network
Biznet
C-Span
The Professional Education Network (PEN)
AP Newscable
Dow Jones
Reuters News View
United Press International Custom Cable
Arts & Entertainment Network
Silent Channel
Nashville Network
CMTV
University Channel

What's conspicuously absent? **That ole-time religion.** The CRTC will hold hearings later this year on religious broadcasting. PTL, TBN, CBN are not too well revered by our regulatory agencies, and no wonder why! Several of their "ministers" have had allegations levied by the FCC concerning indiscretions with their use of **gifts of faith** received from viewers.

The funny thing was, no-one at the CRTC has access to a satellite dish, so **they didn't realize** that wily old Dr. Gene Scott's channel, **(the University Channel)** is not beaming out University of the Air, or Sunrise Semester, but rather, broadcasts that ole-time religion. **Several bureaucrats in Ottawa are wondering what to do about that blunder.**

This could give SMATV a shot in the arm. If you are a regular CSD reader, you probably know that the CRTC and Department of Communications had established some rules governing SMATV (a Master Antenna system is not subject to licensing, **provided:** "No service received by satellite or microwave transmission is distributed over the undertaking **[SMATV]** other than a service the Commission has authorized the licensee of a broadcasting undertaking **[cable system]** serving the area in which the undertaking is located, to distribute on its undertaking.").

When the revised regulations came into force on February 1st, 1984, it became a **"CATCH-22"** because you couldn't distribute U.S. Domsat signals on SMATV **because** no Canadian cable company had ever been licensed to carry U.S. Domsat signals. Under the new policy and licensing decision, if a cable system in the same town or city carries 5 U.S. satellite signals, (from the approved list, see above), then the SMATV system will be able to carry **the same channels.** This is all provided the money charged for the SMATV service is not more than the money charged by the distributor of the programming service. **My reading** of that is, if CNN charges SMATV 30 cents per sub , the SMATV operator cannot charge 40 cents to his subs.

Of course, the SMATV system would also have to carry the "off-air" signals too. The part of this which makes **no sense** is the scenario of **why** the **SMATV system has to carry the same 5 channels** as are on cable in its area. Cable operators might not choose channels for their subs which appeal to SMATV viewers. Do SMATV operators **really want** Financial News Network? In Toronto, one of the largest cable operators has announced a deal with FNN. Does that mean under the CRTC guidelines SMATV operators **must carry** FNN? Perhaps. Obviously there will have to be a lot of fine-tuning.

It is clear, however, if you operate an SMATV system in Canada, you **will have to clear** viewing rights or permission **directly from** Nashville Network, CNN, etc. But then again, doesn't everyone in this industry want to go legit? It is also clear that if you operate an SMATV system in Canada and offer WOR, WTBS, WPIX or WGN, or HBO or Showtime, MTV or ESPN, you will **not be exempt** from licensing **(and you won't get a license anyway),** and you **will be caught** in a Catch-22, and **will be subject to prosecution** if and **when** the law is amended (see **CSD** May 01, 1984).

Our advice to any dealer planning to install an SMATV system in Canada is get **good legal advice before** you do anything. In this volatile climate, case-law like the Winnipeg Holiday Inn can be reversed quickly. The last thing you want is a civil suit from some condo owners who have forked out $25,000 or $30,000 for their systems.

There **is** some good news in all of this for everyone: You've probably noticed that all of these "new" services are based on the premise that **there shall be transborder** satellite communications.

Anyone with a motorized dish living on either side of the border has known for a long time that things have been up-linked in very funny ways. For example, how do all of those U.S. baseball teams get beamed home aboard Westar 4 from the Expos' Olympic Stadium? Or what about those Satellite Express newsfeeds to CBC Toronto aboard a variety of U.S. satellites? You get the picture!

The plan is **reception will be permitted** on **both sides** of the border. That international exchange of letters, which has always been used as a lame excuse to prohibit transborder communications, is starting to crumble. The Department of Communications has been re-drafting the rules for transborder. The problem is, some of the bureaucrats within D.O.C. are so out of touch with reality that they didn't even know the scope of **existing** transborder communications.

Of course, Telesat (the Canadian carrier) **is starting** to warm to the idea of transborder communications, with Anik D1 quickly filling up. With the loss of Westar 6 in space, with other U.S. launch delays, and, with USCI using some space on Anik C2, allowing import of up to 5 U.S. specialty services **(which aren't all that special)** is not a bad trade-off. More about the machinations in the coming months. The bottom line, of couse, is that there will be more sports and music up on satellite. With CBC programs on D1 and all of those radio subcarriers, a lot more U.S. dishes will be turning to Canadian satellites.

One footnote: The newspapers are full of stories about mergers between First Choice and Superchannel pay-tv. If true, this would mean a major cutback in 12 GHz transponder use.

A COUPLE Of Random Notes:

The Anik C2 signals are providing much better footprints than originally thought. Mike Nawrocki, of the Department of Communications at Thunder Bay, Ontario (which is not far from Duluth, Minn.) tells us that he is able to watch the ATV service which originates in Halifax. They only have a quarter-beam transponder, and transmit with reduced bandwidth. The remarkable thing is the quarter beam footprint falls (in theory) almost a thousand miles **east of** Mike's TVRO. He is using a first-generation 12/14 set up consisting of an Andrew dish, and electronics manufactured by Electrohome. Reception is not always great. In fact, in heavy cloud and mist, Mike says, there are a lot of sparklies. But then again, noise figures for 12 GHz LNCs have not always been that good. Mike is impressed by the 12 GHz reception within "his" footprint area.

The CRTC, citing its "get tough" attitude, **has declared war** on unlicensed broadcast operations. The modus operandi of these "unlicensed" operations involves a TVRO, and a broadcast transmitter, and a tower located on a high spot of land. The programming often includes HBO and a superstation and involve multiple channel operations. A United Press Canada story said: 'Communications Minister Francis Fox warned that satellite **broadcast operations** in remote communities could be shut down unless they applied for CRTC licenses. At least one operator, in the northern Ontario town of Red Lake had equipment confiscated by the RCMP and faces charges for

operating an unlicensed broadcasting network (sic)."

They quoted Mr. Fox as saying:

"The only places where the CRTC has intervened to date is in places where a licensed operator has this form of unfair competition or where a licensed operator can't get his service off the ground **if someone is allowed to operate an unlicensed system.**

Once someone receives a license to bring in a package of CANCOM signals, obviously **we would expect the unlicensed operator** to make an application themselves to bring in the signals that are being authorized by the CRTC.

To do it any other way would be unfair to the Canadian businesses that have set up CANCOM and have spent a great deal of money to be able to bring signals to communities across the country. I think most people in the Canadian community, most people who live in the underserved areas, would far prefer to have a package of Canadian signals to a package of American signals."

I certainly concur with that statement. I would rather have the Detroit stations any day of the week, rather than the Buffalo, Rochester, Duluth, or Minot signals that most Canadians in the major cities get off-air or via cable! Hopefully the Orion personal decoder will make it possible to enjoy some good big-city network stations.

We **have confirmed** that CANCOM is moving into its consumer phase. We hope to obtain one of the first Orion "consumer" decoders. If successful, we hope to provide a detailed report in a future edition of CSD. We also hope to obtain a sample model of the 12 GHz DBS system to be marketed in Canada shortly.

SMATV SYSTEM ENGINEERING: Part Six

RF Distribution

When we last left the subject of SMATV (CATV) plant design, we had worked our way from modulators and combining of off-air signals through sub-distribution systems to the AC powering system which is duplexed on the coaxial cable that carries the TV (RF) signals for distribution. Our last part in this series appeared in the June, 1984 issue of **CSD.**

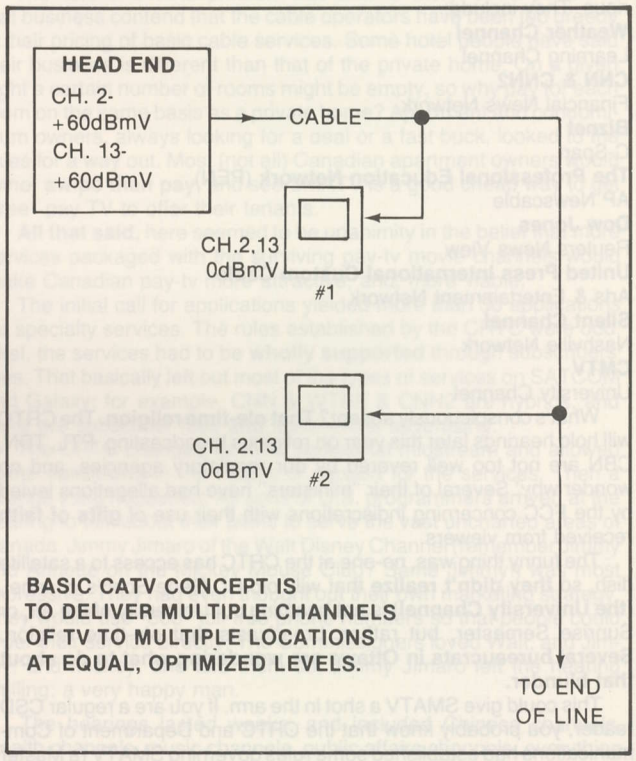
This month we will begin our look at the RF portion of the distribution plant and define some of the terminology and objectives of RF distribution.

The ideal SMATV/CATV system would connect each home to the headend facility alone; that is, the SMATV dishes, the modulators, and the signal processing equipment would be cost-effective for just a single home and that single home could then enjoy the 7 or 12 or 21 (etc.) cable delivered channels through its own custom cable system. Very few homes can afford or justify such an expense, of course, so the 'community concept' of sharing a TV distribution service was born.

SMATV is supposed to stand for '**S**atellite **M**aster **A**ntenna **T**elevision.' Private Cable means the same thing. The idea is that SMATV differs from CATV in that the SMATV or private cable system does not serve an entire community or municipality; **it only serves a development** such as a condo group, an apartment group, or a private (non-municipal) housing development. SMATV is however, for all practical purposes, merely CATV without the legal identity of cable. As such, subject to the various court and FCC tests now being presented to this new fledgling industry, it is not a new technology. It is simply CATV on a small scale.

A single residence, outfitted with individual satellite receivers for all of the channels requested and outfitted with individual channel modulators for each of these receivers, would be a very fortunate home indeed. It would have individually processed channels, just like cable processes channels, delivered on a 'custom basis' to each TV outlet in the home. And at a considerable cost. Now let's suggest that a neighbor wishes to be connected to the system. The problem does not seem complex; the neighbor is connected to the master headend system through some more cable. Is not the neighbor's "drop line" merely like another outlet in the primary home?

Having done that, then we have yet another neighbor, and another, who also desire the service. More cable, more outlets. Each is merely an 'extension' of the basic system serving the primary home. **Until we run out of signal.**



The headend, whether made up totally of modulators (ie. all signals are satellite delivered and the satellite receivers are connected to individual channel modulators), or made up from some combination of satellite fed modulators and off-air (VHF/UHF) terrestrial-antenna services, is your basic 'cable TV headend.' As such, you can design (as we found out in earlier parts of this series) the output signal level(s) from the headend to be just about anything we want, within the design parameters of the equipment chosen. But sooner or later, **we will run out of signal** from the headend; because, as we have previously learned, carrying any signal through cable will weaken the signals because the cable itself has 'resistance'; a fancy term for describing the gradual weakening of signals carried through more and more cable.

We have also learned in previous segments of this series that the cable's resistance is a function of two things:

1) The **frequency** of the signals (ie. the channel), and,

2) The size or **diameter** of the cable.

Higher frequencies, we learned, have greater cable resistances and therefore higher numbered channels get weaker, faster, in a given length of cable. And smaller cables have greater resistance at all frequencies (but still higher losses at higher channels) so we try to

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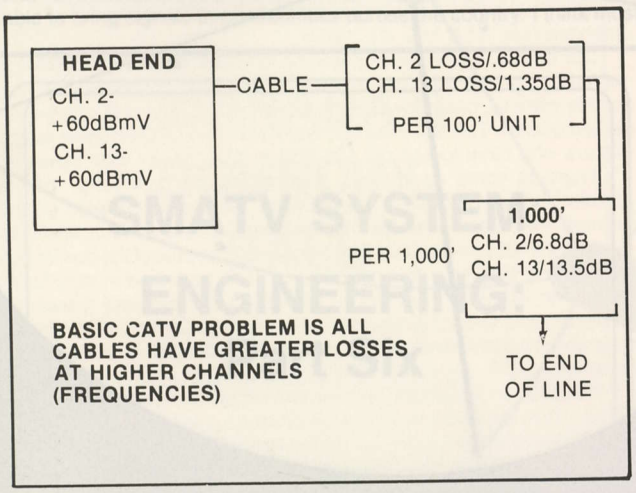
select a cable size which balances its physical size/cost against its resistance or loss.

The most basic of all basic design problems with any cable distribution system is the cable's signal loss, or resistance. This basic problem is compounded by the wide range of operating frequencies which we encounter in the typical cable distribution systems. As **the diagram here** shows, we might select a cable (.412 type which is just over 4/10ths of an inch in diameter; .412" to be precise) which has a measured loss of 0.68 dB per 100 feet **at TV channel 2,** and 1.35 dB loss per 100 feet **at TV channel 13.** Ideally we would select a cable that has the **same loss** at channels 2 **and** 13 but this is not an ideal world; **there is no such cable.**



All cables utilized for cable TV systems have quite exact, and very predictable loss characteristics. If the manufacturer tells us the loss will be 0.68 dB per 100 feet at TV channel 2 (55.25 MHz), then we can compute that the loss in 1,000 feet will be ten times 0.68, or 6.8 dB. Or for channel 13, 1.35 dB per 100 feet and therefore 13.5 dB for 1,000 feet.

We also have certain known criteria for each television receiver to be connected to our cable distribution system. Thirty-five years of cable technology and more than a decade of direct FCC involvement in cable's technical affairs has taught us that 'typical' television receivers respond in certain ways to certain types of input signals. From this information and knowledge we know that we must design our cable systems so that they will deliver a certain grade or level of television signal on each cable channel to each television set connected to the cable. A representative set of FCC approved numbers appear here:

1) Signal level to subscriber receiver / **0 to + 10 dBmV**
2) Signal to Noise Ratio/ **43dB** (minimum)
3) Signal to composite triple beat / **51 dB** (minimum)
4) Signal to hum modulation/ **40 dB** (minimum)
5) System response/ ±1.5 dB within a 6 MHz wide channel, maximum
6) Signal to beat interference/ **60 dB** (minimum)
7) Signal to reflections (mismatch)/ **40 dB.**

Items 1, 3, 6 and 7 are set virtually totally within the cable distribution portion of the plant; items 2, 4, 5 are first established at the headend but ultimately they can be degraded (but never improved) in the cable plant. An SMATV system, presently, **does not have an FCC requirement to meet any of these standards.** However, good engineering suggests that what are 'minimum performance standards' for CATV should also be minimum performance standards for SMATV. And, if you believe that one day, before it is all over, SMATV will, like CATV, have technical requirements mandated by federal or other authorities, it is only good business sense to insure that your new SMATV system-builds at least attain the minimum CATV mandated standards.

In an earlier installment we found out that while the headend signal level may indeed be quite strong (such as +50 to +60 dBmV), the customer's television receiver(s) will not perform properly at such a signal level. Just as **too weak** a signal causes snow (noise interference) with any form of television reception, so too will **too much** signal cause interference of a different sort. That's why the FCC rules require that the cable operator 'adjust' the signal level to each subscriber's receiver to be within the region of **0 dBmV** (which is actually the same as 1 millivolt or 1,000 microvolts across or on a 75 ohm cable), and, **+10 dBmV** (3,200 microvolts or 3.2 millivolts on a 75 ohm line).

Yet we may have an SMATV headend which starts off with much higher signal levels; such as +60 dBmV. We previously learned that by using appropriate 'tap off' units we could 'isolate' the individual receiver outlets from the main (trunk) line signal, and extract just the required amount of signal voltage out of the main (trunk) line to deliver the appropriate signal level to the TV receiver. If we had a TV set located directly at the SMATV headend, for example, and we wished to supply it with +10 dBmV, while our headend level was +60 dBmV, we would need to somehow 'isolate' our TV set from the headend by a 50 dB (60 - 10) device.

Recall, however, that our cable connecting our headend to our subscriber homes **has loss** and that this loss is a function of frequency; at the end of 1,000 feet of our example .412 cable we had lost (due to cable resistance) 6.8 dB of channel 2 signal and 13.5 dB of channel 13 signal. Obviously we could not connect a signal tap or isolator device to the cable at the end of a 1,000 foot run and maintain **equal signals** on channels 2 **and** 13 to a TV set at that point; simply because channel 2 is 6.7 dB stronger than channel 13 (13.5 dB loss in 1,000 feet at channel 13 minus[-] 6.8 dB loss in 1,000 feet at channel 2; = 6.7 dB difference in level between the two signals). Obviously this 'relationship' between the lowest channel on the system (ie. the one with the least amount of cable loss) and the highest channel on the system (the one with the greatest amount of cable loss) is only going to get worse as we get further and further and further from the 'power source;' our headend. The more cable we travel through, the more divergent the two extreme channels become in level.

And that brings us to the second most difficult design problem with an SMATV/CATV system: how to keep the signal levels close together so the TV receivers connected to the line don't find channel 2 high quality, and channel 13 low quality (noisy).

AMPLIFIER Spacing

Very few SMATV/CATV systems can be totally served from a headend. That is, it usually takes more cable to 'wire a project' than you can run just out of the headend alone and still reach every home with a proper signal level. This means, as we discussed in our June portion, that you must re-amplify the cable signal one or more times beyond the headend to compensate for cable attenuation (losses). Remember, the home wants to see between 0 dBmV and +10 dBmV level signals; anything weaker than 0 dBmV flirts with 'noise' in the picture and anything stronger than +10 dBmV encourages 'signal overload' problems with the TV receiver.

We can easily weaken the signal going to the home simply by placing an attenuator (fixed pad) in the line to the house; or, by using a tapoff device that 'isolates' that home TV set from the balance of the line by a prescribed amount of isolation (such as 50 dB or 10 dB). But what happens when you need the opposite type of cure; **more signal,** not less signal?

The answer is an amplifier; you select an appropriate signal amplifier and you re-amplify the signal that has traveled out of the headend through the coaxial cable to this point where the combined cable losses have gotten severe enough that **any further cable losses** would make the signal(s) noisy and unuseable.

Remember that our cable has unequal losses at different frequencies (channels). Our high channels will weaken more, faster, than our lower channels.

We are familiar with noise in TVRO; when our signals are not sufficiently strong to paint clean pictures on our TV screens, we say there are 'sparklies present.' TVRO pictures are not supposed to have sparklies in them. We are also sort-of-familiar with something called carrier to noise and signal to noise ratio; we may remember that we need certain minimum ratios between the good guy (the signal) and the bad guy (the noise) or the bad guy (the noise) will infiltrate the good guy (the signal).

You may remember that a TVRO receiver is supposed to be 'good' if it has a 'carrier to noise **threshold**' or CNR of 8 dB. If you are more

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astute, you are aware that it takes a CNR in the 10 dB region to insure that our video picture not only has no sparklies, but it also has no 'busy background' (**non-sparklie noise**) present either.

Regular TV signals have similar measurement procedures. Only, because these are AM (amplitude modulated) signals rather than FM (frequency modulated), the numbers get bigger for the same effects. The FCC told us that the minimum signal to noise ratio they will accept, inside of the subscriber's home, is 43 dB. You can relate to what 43 dB signal to noise is on an AM signal by thinking about how an FM signal looks when you have a CNR of 8 dB. The two are about equal. An 8 dB CNR, is as we all know, a picture with just a hint of sparklies in it **if** we are dealing with a top grade TVRO receiver. Now it happens that if we are creating our SMATV pictures from a TVRO signal, and we have an 8 dB CNR at the satellite receiver, the video that comes out of the satellite receiver can never be any better than a 43 dB signal to noise ratio equivalent in an AM signal. So an SMATV system that starts off with an 8 dB CNR signal is going to be very borderline, according to FCC specs, to begin with. **We'll return to that** in a later part of this series.

To maintain a 43 dB signal to noise ratio (SNR), we have to take special pains to insure that the cable signal never gets too weak (ie. it never starts to get 'noise' in it) on the cable, before we re-amplify it again. This could (and would) happen if we allowed the signal to go too far in the cable before we ran it through a cable station amplifier. This, then, establishes a minimum cable line signal which we can tolerate before we must stick an amplifier station in the line.

Most CATV line amplifiers have certain 'minimum input levels' which must be respected, by the system designer (he's the one who decides when and where and what to stick in the line for re-amplification purposes). A typical specification calls for an amplifier whenever the weakest channel on the line drops to +8.5 dBmV. Most systems function so that the actual minimum line signal before a re-amplifier station is added is actually higher than this number; **+12 dBmV is more typical,** and we will see why.

And that gets us back to the different levels between the highest channels (which have the lowest signal levels because of higher or greater cable attenuation), and, the lowest channels (which have the highest signal levels because of lower or less cable attenuation). Somehow these levels must be 'equalized.'

The simplest form of equalization is to start off the signals, at the headend, so that the lowest channel (channel 2 in our example) leaves the headend with a lower signal than the highest channel (13 in our example). If we approach it this way, here is what happens:

1) We know what the maximum output from our channel 13 headend modulator or off-air amplifier can be. For right now let's call it **+52.5 dBmV.**
2) We also know what the minimum recommended **input** signal level can be, on that channel (13), to our first line amplifier station; let's call it **+12 dBmV** for now.
3) Now, we also know that the cable has **1.35 dB** of loss per 100 feet at channel 13.
4) Where does the first amplifier station have to go?
   - **A)** Headend output level-channel 13 = +52.5 dBmV
   - **B)** Minimum input level to first amplifier-channel 13 = +12 dBmV
   - **C)** Amount of cable loss practical between headend output point and input to first amplifier = 52.5 dB − 12 dB or **40.5 dB** of cable loss;
   - **D)** 40.5 dB of cable loss, divided by 1.35 dB per 100 feet = 3,000 feet of (.412 type; example) cable.

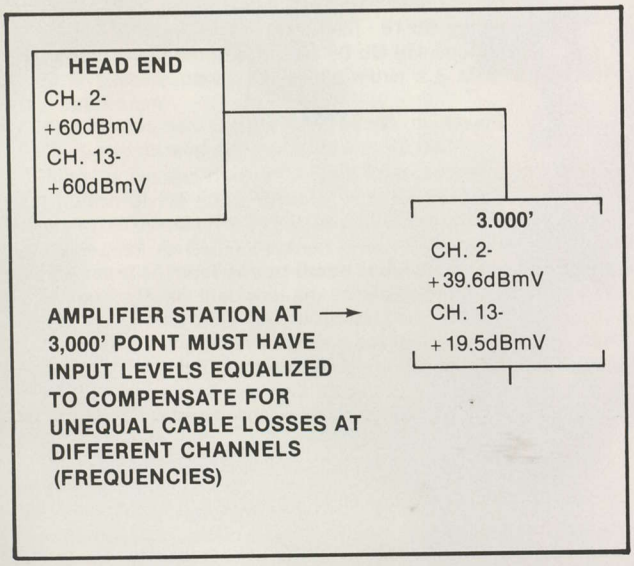
Now we know how far 'down the line' our first cable amplifier should be (3,000 feet). Now, how do we calculate the permissible output level for our **lowest** channel; 2?

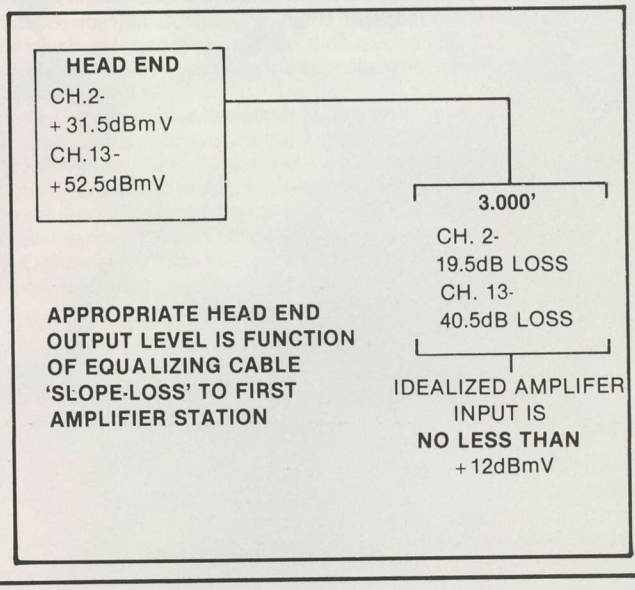
1) We know the length of cable (3,000 feet);
2) We know the cable loss at channel 2 (**0.65 dB** per 100 feet);
3) How much loss will 3,000 feet of cable have at channel 2 (**answer:** 30 multiplied by 0.65 dB (loss is .65 dB per 100 feet and we have 30 increments of 100 feet in 3,000 feet) = **19.5 dB.**
4) Then, at what level should channel 2 leave our headend?
   - **A)** If channel 13 will have 40.5 dB of loss, and
   - **B)** Channel 2 will have 19.5 dB of loss,
   - **C)** Then the difference between the two is 40.5 − 19.5 or 21 dB, and therefore,
   - **D)** The channel 2 output level at the headend should be the channel 13 output level (52.5 dB) **minus** 21 dB, or **31.5 dBmV.**

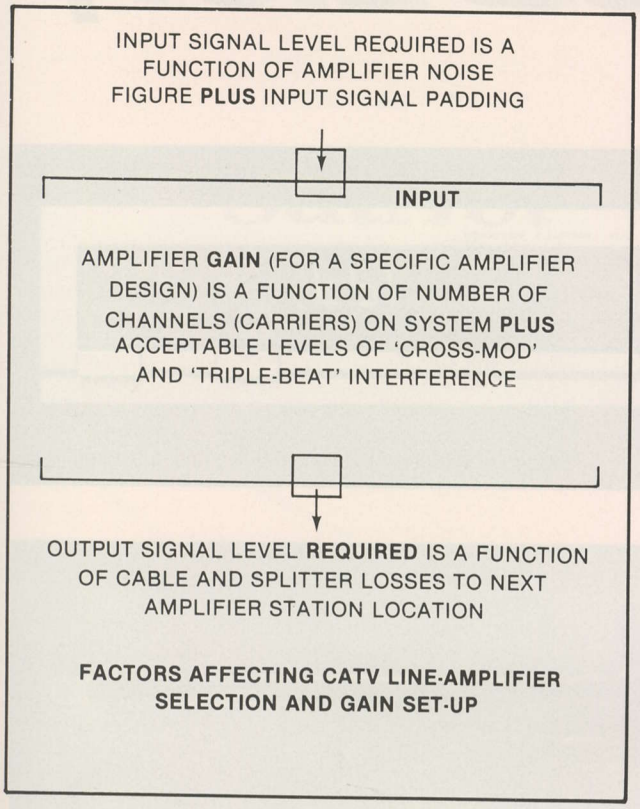
Now we have the operating parameters for our headend, and we can see that in our example, we have quite a level difference between the lowest channel and the highest channel. This difference is often referred to as 'tilt' or 'slope.' The channels in between 2 and 13 will stair-step; channel 3 will be slightly higher than channel 2, channel 12 will be slightly lower than channel 13, and so on. In the end, we have all of the channels arriving at the input to our first line (re) amplifier at the same signal level; +12 dBmV. That's **one way** to make it work.

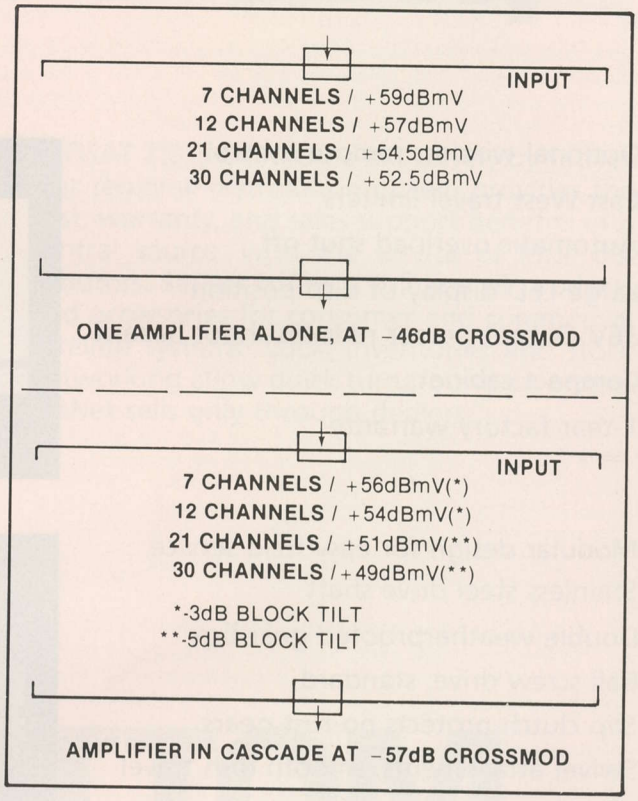
But the signal to noise ratio, translated to the minimum required input signal level to the line amplifier, is **only one** of the **many technical specs** that concern a cable system plant designer. Let's see what some of the others are:

1) The gain of the amplifier is not fixed, it is a variable function. The amplifier has a 'gain control' and a gain-control-range.
2) In addition to the tunable gain-control-range, there is also a provision to 'pad down' (as in attenuate) the input signal when the amplifier station may be spaced closer to the signal source than 'ideal.'
3) The operating gain of the amplifier is a function of the number of channels (ie. carrier signals) being transported on the cable. When you have **more channels** through the amplifier, you









have **less gain available per channel.** The **total gain** is the same in all cases, but that gain must be **divided amongst** the number of carrier signals present.

4) Failure to 'derate' (as in turning down) the overall gain of an amplifier, when you have many signals present, will cause one or two undesireable by-products:
   - **A)** The amplifier may exhibit something called **'cross-modulation'** (where the modulation from one channel/carrier superimposes itself on-top of another channel on the system), or,
   - **B)** The amplifier may exhibit something called **'composite triple beat'** (where the various channels going through the amplifier 'beat or mix' together causing a new, second set of signals in the amplifier; interference signals coming from the mixing of the wanted signals).

Alll of these considerations must be taken into design consideration when every amplifier in the system is selected (by model and characteristics), and placed in the plant at a specific point in the cable.

There are known parameters for derating (turning down) the gain of the amplifier, to compensate for potential cross-mod and 'composite triple beat' problems. You obey those rules for each amplifier station, or pay the price with degraded pictures. There are also known 'losses' associated with getting from the amplifier station in question to the next amplifier station; losses in the cable, losses in two or multi-way line splitters, and losses associated with inserting customer tapoff (isolated connections) units in the line. Fortunately, there are relatively simple formulae to apply when laying out a cable distribution plant and we'll touch on those before finishing with this subject.

WHEN It Isn't

A quick glance at a line amplifier specification sheet might tell you that the amplifier is capable of 40 dB of gain and it is capable of operating at +52 dBmV output level. **Read further.**

The same sheet may also tell you that the amplifier is capable of 40 dB of gain and +52 dBmV output level **only for 7 channels.** And you have plans to carry 12 or 20 channels. We already know that more channels will cause us to derate or backoff the amplifier's output specification which is the same as backing off on the gain we can use.

Let's look at an example, here. The data sheet says that we can get +59 dBmV output with seven channels, +57 dBmV output with 12 channels, +54.5 dBmV with 21 channels or +52.5 dBmV with 30 channels. It also says that this would be for a **stand-alone amplifier** where we were willing to accept a cross-mod number of −46 dB.

The −46 dB cross-mod number tells us that we **are** going to have cross-mod with this amplifier. It also tells us that the cross-mod will be 46 dB weaker (written as **−46** dB) than our output level. Another way of looking at this is that if our output level for 12 channels is **+57** dBmV, our cross-mod output will be 57 − 46 or **+11** dBmV. Is that adequate? Perhaps, but marginal.

The same amplifier data sheet also tells that that we must derate that amplifier by approximately 3 dB if we want the cross-mod to be down to −57 dBmV. A little study would reveal that cable systems maintain a cross-mod goal of −57 dB and that suggests that the −46 dB number may not be that good. **It isn't.**

So we see now that the same amplifier, derated or gain-turned-down to a point where the **undesireable** cross-mod signals are at least −57 dB reference our output signal levels will have 7 channels at +56 dBmV, or 12 channels at +54 dBmV or 21 channels at +51 dBmV or 30 channels at +49 dBmV. This tells us that if we elect this particular line amplifier, we would do well to operate it in the 'CATV mode' which for 12 channels would be an output level of +54 dBmV.

Careful reading of the same illustration will reveal an asterisk. It says "3 dB block tilt" and "5 dB block tilt." What is that all about?

We used the term 'tilt' once before; interchangeably with the word 'slope.' The two are related, but in fact seldom inter-changeable.

Tilting

We already know that the cable losses are always going to be higher for the higher frequency/channel signals. And since our cable plant is made up of lots of cable loss, we will through the sum of the total cable plant have far more cable loss on channel 13 than we will at channel 2.

We have also figured out that between each signal source (headend or amplifier station) and the next signal amplifier, we are

SMATV DESIGN/ continues on page 22

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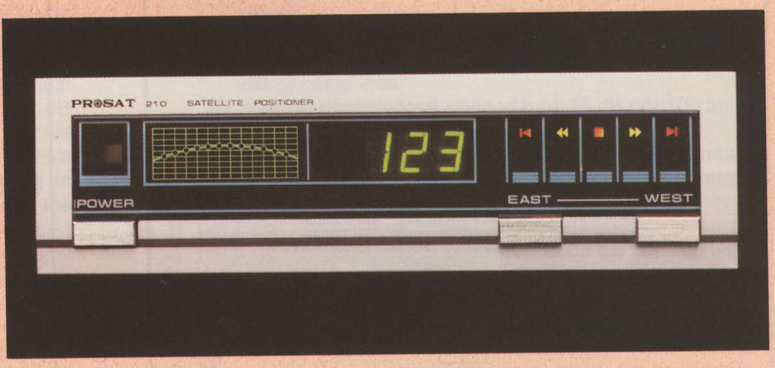

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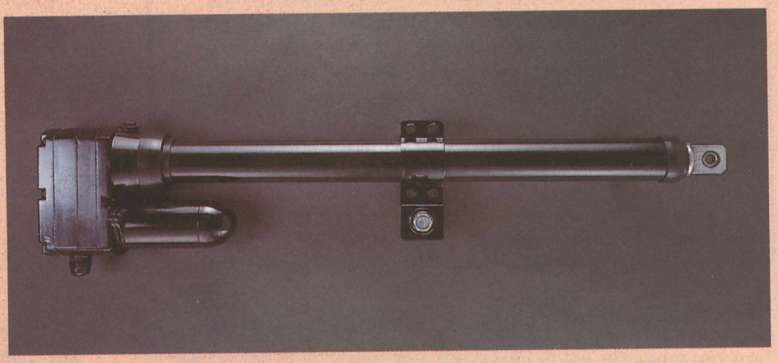

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SMATV DESIGN/ continued from page 19

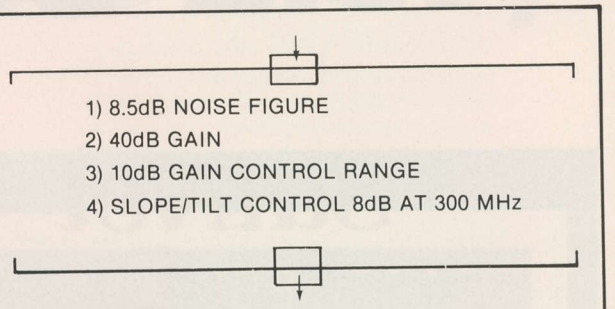
constantly fighting this 'uneven loss.' Everytime we leave an amplifier station, we have to be concerned that we will arrive at the next amplifier station without a trememdous (or troublesome) difference between the lower channels and the higher channels.

Tilt is one way to build in some of that difference, **from the beginning.** We saw how we did this when we left the headend, in our example; we 'tilted the output' on channel 2 so that it was +31.5 dBmV and the output on channel 13 was +52.5 dBmV; **a 21 dB 'difference.'**

Now it happens that we will almost always have a longer cable run between the headend and the **first** amplifier station than we will in any other portion of the cable plant. A 3,000 foot run in this example is about three times as far as a normal **amplifier to amplifier** spacing. It works out that when you have amplifier output levels and plant losses in things other than cable (such as splitters, taps et al), you end up moving amplifiers closer together. If the cable run from the headend to the first amplifier can be 3,000 feet in our example, but the typical cable run is 1/3rd of that, this tells us that we will be around **1,000 feet** between the first amplifier **and** the second amplifier, 1,000 feet again in between the second amplifier and the third amplifier, and so on. This also means that the difference in cable losses between channels 13 and 2 will be about 1/3rd of our headend to first amplifier example; rather than 21 dB difference we will measure or find a 21 divided by 3, or 7 dB difference

This is a far more manageable number than 21 dB.

So let's 'experiment' a little. Let's use a special control built into the amplifier to on-purpose 'tilt' the output of the line amplifier. We did the same thing back at the headend by individually adjusting the output levels on the individual modulators to obtain the appropriate tilt/slope we wanted for our example (+31.5 dBmV on channel 2, a little more on channel 3; up to +52.5 dBmV on channel 13, a little less on channel 12, etc.). We don't have **individual channel** controls in our **line amplifier,** but we do have a control that will attenuate the **lower channels more** than the higher channels. It is called 'slope' and it **'slopes the gain'** of the amplifier so that the output is higher on the high frequency end than it is on the low frequency end. **In our example,** we have an amplifier that is designed to operate all the way to 300 MHz (well up into super-band, above channel 13) and it can slope '8 dB between 300 MHz on the high end and channel 2 on the low end.' We'll ask it to **slope 6 dB** between channel 2 and 13, but we'll help it by coming to the amplifier with slightly uneven signal levels; +12 dBmV on channel 2 and +15 dBmV on channel 13. **The combination** of the slightly tilted input (3 dB lower on 2 than 13) and the slope control built into the amplifier will give us the total of 6 dB of output slope (or tilt into the next piece of cable).



RECOMMENDED INPUTS/

1) +12dBmV CH.2
2) +15dBmV CH. 13

REQUIRED OUTPUT/

1) +21dBmV CH. 2
2) +38dBmV CH. 13

ACTUAL INDIVIDUAL AMPLIFIER GAIN AND OPERATING PARAMETERS ESTABLISHED BY SYSTEM REQUIREMENTS

Once this relationship has been established in the plant amplifier portion of the system it becomes a repetitive process to keep it going through the balance of the plant itself.

REMEMBER

Individual plant amplifiers have gain ability that is dictated by the number of channels through the amplifier (more channels, less gain available), gain that is limited by the level of permissible cross-mod in the system (−57 dB cross-mod level is recommended for CATV plant quality pictures), and gain that is limited by the permissible levels of composite triple beat (interference). **All of these factors inter-play** with the plant layout, and the placement of amplifiers.

We'll see how you go about assessing a plant layout in our next installment in this series.

DOMSAT'S OFF-SHORE PUDDLES

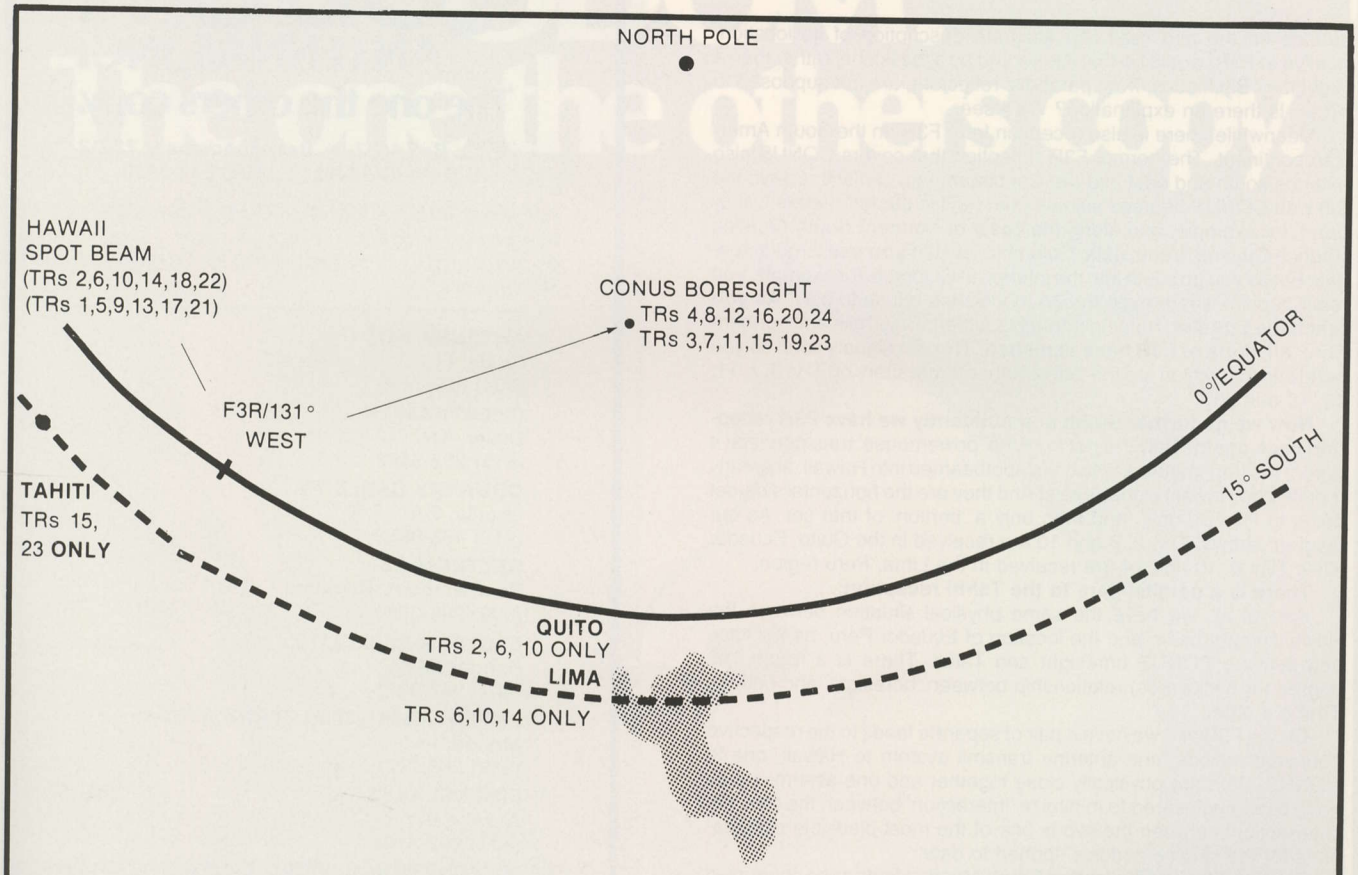
PUDDLES/Two

(**Correction:** In our **July 01 CSD** we reported on the horizon-to horizon coverage for Galaxy 1 and 2 birds, noting that the Galaxy 2 feed for AFRTS on transponder 20 should be available into western Europe and northwestern Africa. The Galaxy 2 feed of AFRTS has landed on **F2R's transponder 20** in the period between preparation of this report and its publication. The only video on Galaxy 2 recently has been on transponder 13 where **live NASA coverage** of the **Space Shuttle** flight[s] has been carried. Prior to and during such coverage, when no live video is being transmitted, a color bar pattern is found on this transponder. With AFRTS on **TR20 of F2R,** the prognostications concerning AFRTS availability with 25 dBw (up) signal levels into western Europe and northwestern Africa are now invalid. In the event that additional video does appear on G2, we will alert you here or in CSD/2.)

Our look at Galaxy semi-hemi zone coverage in the July 01 CSD has provoked considerable interest virtually worldwide. Not all of that response has been favorable since the Galaxy birds are at least on paper intended for **North American** (DOMSAT) service **only.** What follows will possibly evoke even less positive response since it will point out areas in the western hemisphere where actual terminal tests have revealed the presence of US and Canadian DOMSAT signals far away from their actual boresight beams. Readers are referred to the CSD July 01 report since many of the diagrams appearing with that report are important in this final installment as well.

Puddles, unlike the Galaxy semi-hemi contours, **are not supposed to exist.** The exact extent of their existence is not known. That as many have been discovered as we relate in the material here suggests that they are far more common than we might have previously expected. Here are the apparent 'ground rules':

1) Puddles typically are in the 20 to 23 dBw region although



F3R PUDDLES OBSERVED TO DATE

certainly they can exist at lower levels as well;

2) Puddles recorded to date tend to come from birds which have at least some 'spot-beam' capability; birds such as Galaxy which have semi-hemi coverage have not been found, to date, to create puddles;
3) Puddles, for reasons still to be explained, do not seem to occur for all of the transponders on what one would normally associate together as belonging to a 'single antenna set.'

This last point begs further explanation and study.

Let's use one rather exotic example, first. Tests conducted in Tahiti, using a 16 foot mesh dish with unproven gain characteristics, an AVCOM 3 receiver and a California Amplifier 75 degree LNA revealed useable level signals from F3R's TRs 15 and 23 (**CNN-2** and **Cinemax**). There was no indication of signals from the other transponders in the same transmit/antenna set (ie. 3, 7, 11 or 19) and no indication of signal present from any of the other three 'transponder sets' of F3R. (ie. TRs 1, 5, 9, 13, 17 and 21; TRs 2, 6, 10, 14, 18 and 22; TRs 4, 8, 12, 16, 20 and 24). This is a pattern which will repeat itself in most of our other examples to be cited here. There is no apparent 'easy explanation' for this unless one suggests that the receive terminal was somehow defective and only capable of receiving the two transponders in the set (or TI was wiping out the balance of those present). However, when, as we shall see, this is a pattern that repeats itself throughout virtually all of the balance of the 'puddle reports,' we must come to the conclusion that something unusual in the antenna transmit system pattern is repeating itself over and over again, allowing **only certain transponders** to 'leak through' into the puddle zones.

F3R First

The major bird of interest is always F3R, a function of its heavy cable directed programming, and the fact that for the better part of every day there is some type of service on all 24 transponders. Having all transponders active is a 'plus' of course since this allows the 'puddle finder' to verify those situations where only a few of the transponders are making the grade to the exotic location.

Let's review what we know about F3R, first:

1) There are 24 transponders on board,
2) 18 of those transponders are 5 watt power,
3) 6 of those transponders are 8.5 watt power.

And,

4) 12 of the transponders (all in the 5 watt class) are directed at CONUS (continental USA) and they are **also sent** as spot-beam signals at reduced levels to Hawaii (transponders 2, 6, 10, 14, 18 and 22 horizontal; transponders 1, 5, 9, 13, 17 and 21 vertical);
5) 6 of the transponders, also 5 watt in power, are sent only to CONUS (transponders 4, 8, 12, 16, 20 and 24);
6) 6 of the transponders, 8.5 watts in power, are sent only to CONUS (transponders 3, 7, 11, 15, 19 and 23).

Now, since Tahiti lies in the general direction of Hawaii, one might expect that **if** there was any F3R service in Tahiti, **it would come from** the spotbeam transponders serving Hawaii. **Wrong.**

The service to Tahiti, on transponders 15 and 23, comes from the 8.5 watt set of transponders boresighted ONLY ON the CONUS region. In other words, the **exact opposite set of antenna patterns** you would first assume 'might' make it to Tahiti. This pattern will repeat itself.

Tahiti is located west of F3R (remember that F3R's main CONUS beam points back towards the US from the west/south), and to the south. It comes close to being exactly behind the CONUS pattern (see diagram here) and therefore almost behind the parabolic reflector

surface on the bird itself. An accurate description of its location, relative to F3R, would be that it is served by a 'backlobe' rather than a 'sidelobe.' Backlobes, from parabolic reflectors, are not supposed to occur. Is there an explanation? We'll see.

Meanwhile, there is also reception from F3R on the South American continent. The normal F3R reception that covers CONUS also extends south and east into the Caribbean; you can still receive the 8.5 watt CONUS beamed signals from F3R in the far eastern Caribbean, for example, and along the coast of Northern South America (French Guyana, Venezuela, Colombia, et al) **if you use** large antennas. But as you go south into the interior, in Colombia for example, you reach a point where even the 30 foot dishes refuse to play. **As you reach the Equator,** running through southern Colombia and northern Peru, **all signs of F3R have vanished.** The last signals seen as you head into that region are the 'powerhouse' 8.5 watters on TRs 3, 7, 11, 15, 19 and 23.

Now we go further South and suddenly we have F3R reception back again! Only it is not from the 'powerhouse' transponders; it is from the transponders which are spotbeamed into Hawaii; at greatly reduced (to Hawaii) signal levels! And they are the horizontal side-set going to Hawaii, only, and then only a 'portion' of that set. As our diagram shows, TRs 2, 6 and 10 are received in the Quito, Ecuador while TRs 6, 10 and 14 are received in the Lima, Peru region.

There is a parallel here to the Tahiti reception.

First of all, we have the same physical situation between the Hawaiian spot-beam and the location of Ecuador/Peru, as we have between the CONUS boresight and Tahiti. There is a rough 180 degree (or backwards) relationship between 'boresight' and puddle. **That's a clue.**

On the F3R bird we have a pair of separate feeds to the respective boresight regions; one antenna transmit system to Hawaii, one to CONUS. Both are physically close together and one assumes they have been engineered to minimize 'interaction' between the two. Yet 'inter-action' between the two is one of the most plausible explanations for the service puddles spotted to date.

The Tahiti and northwestern South America tests were conducted on a 'catch as catch can' premise; none of the test systems installed went there **expecting to find** F3R service. The dishes were installed as tests, and at best they hoped to find useable Intelsat signals. The F3R signals were simply a 'surprise' or 'bonus' to the Intelsat tests. Unknown at this point is how many additional puddles might be located from F3R in other regions 'back behind' the bird. The Pacific region tests were conducted only on Tahiti so there is no additional test evidence to ascertain the extent of the 'puddle size.' South American testing, on the other hand, has been quite extensive now through a broad region that extends east from Peru and south from Ecuador as well. Results have not been encouraging.

The Tahiti reception results were 'there one day' and apparently 'gone the next' indicating that at least in the test location chosen, the puddle is erratic or subject to the day to day variations of the bird's boresight maneuvers. The tests in Ecuador and Peru, on the other hand, reveal solid signals but only in the 3 to 4 dB CNR region on dishes with 46-47 dB of gain. High quality, efficient, dishes in the 50-52 dB gain region would be required for stable, noise free reception.

F4 Next

The RCA F4 bird has a design that is essentially duplicate to the F3R bird. However, until very recently the channel loading on F4 has been light, or erratic at best, and test results therefore may be reflecting less than totally accurate analysis since fewer than half of the transponders have been loaded on a routine and 24 hour basis.

As the map here for F4R indicates, we have reception in Quito from TR7 and reception in Bolivia on TRs 3 and 7. Note again that **(1)** these are the 8.5 watt transponders, and, at least in the Bolivia situation we are back behind the bird, approximately 180 degrees away from boresight, once again. Negative tests from Peru and in other South American locations suggests the puddles on F4 are quite isolated although the Bolivian reception from TRs 3 and 7 has been at a level suggesting a 23 dBw region 'puddle footprint;' a relatively high level for a true 'puddle.'

D3 Next

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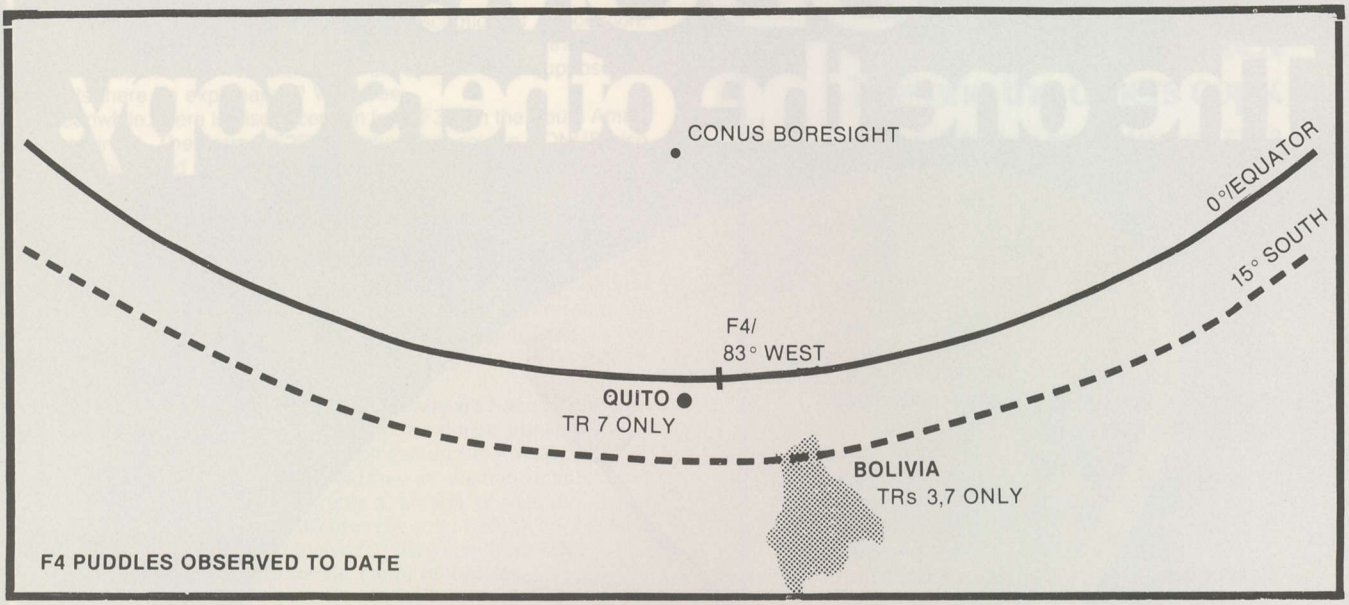


The COMSTAR D3 bird, located at 83 west, has not been a useful supplier of video to regions south of CONUS except for the middle and northern portion of Mexico. The bird, until recently, carried NBC, CBS and ABC network feeds and as a consequence it has been of considerable interest to people who live where regular terrestrial network service has not been available.

The first to discover the bird in a puddle was Quito, Equador where it ran in the 5/6 dB CNR region on a dish with perhaps 47 dB of gain. The signal was stable although there was **no indication of** service on ABC (TR13), NBC (TR1) or any of the other transponders on the bird.

More recently the same pattern has been found in a section of western Bolivia and northern Chile; **TR17 service only.** The fact that CBS is (or was) terminating this service for its regular network feeds (in favor of T301, TR2) has of course hurt those who found this service a welcome addition.

COMSTAR birds have always had a reputation for being 'tight-patterned' and those who have attempted to use their signals beyond their predicted signal contours have had no real success; until this puddle discovery came along.

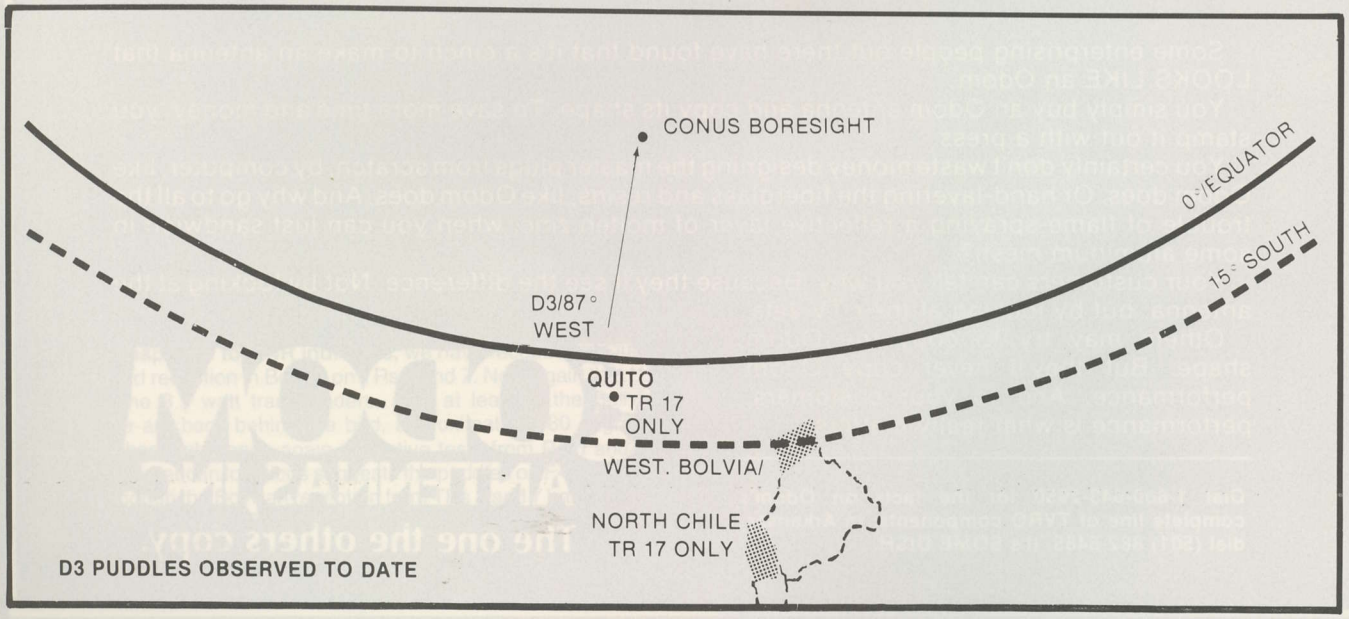
ANIK B and D Next

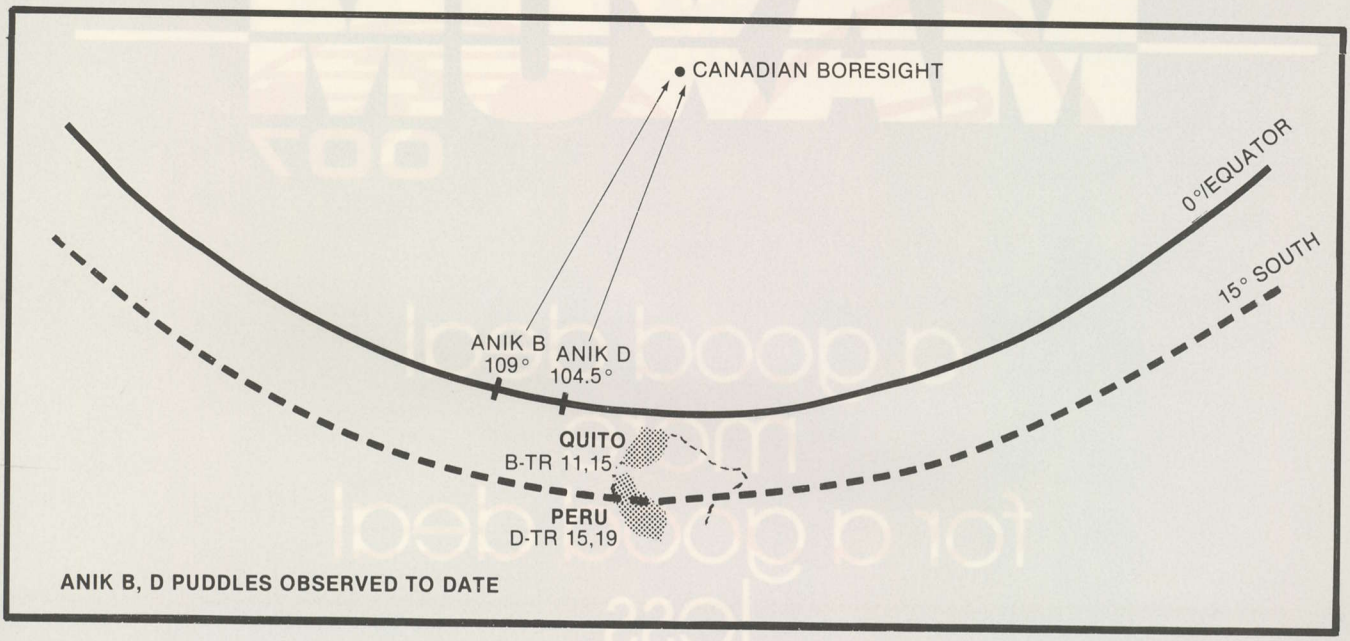
Once again Quito, Ecuador is the fortunate location. ANIK **B** is found here on transponders 11 and 15 at levels approximately 6 to 7 dB CNR on a dish with an estimated 47 dB of gain. This is actually **the best** (highest quality) service obtained in Quito from **ANY** North American domestic bird and some (limited) commercial use on transponders 11 and 15 has been made of this service.

Meanwhile, to the south in Peru, service from ANIK **D** on transponders 15 and 19 has been noted with levels approaching those found in Quito on ANIK B, with a dish in the 46 dB gain region. Service here is, again, 'the best received' from North America, even though the ANIK birds are bore-sighted considerably to the north of CONUS and employ no offset mounted 'spotbeam' antennas such as F3R (for Hawaiian coverage). Note that we have our first 'break' from the 180 degree-behind pattern here; the region receiving signal is around to the 'side' at approximately 90 degrees off of the bore-sight direction. Is ANIK **also** capable of being seen directly behind its bore-sight? There is not much out there, but water, to test with!

PATTERNS In Reverse

What we now know, from the limited number of examples given





ANIK B, D PUDDLES OBSERVED TO DATE

here, is that there is at least reason to be suspicious when we are dealing with any bird that has a sub-reflector feed to deliver spotbeam service to a region such as Hawaii; off of and away from the main (CONUS) beam. Other birds that fit this category are:

1) SATCOM 1R at 139 west (TRs 3, 7, 11, 15, 19 and 23 would be most 'suspicious' to the south-southwest if they become video-active);
2) Westar 5 at 122.5 west;
3) Westar 4 at 99 west;
4) Telestar T301 at 96 west (TRs 2, 6, 10, 14, 18 and 22 to the east/south-east);

No puddle results have ever been reported on antennas **smaller than 16 feet** in diameter (typically 44 dB of gain) although **in theory** you might detect stronger puddles with antennas as small as 12 feet in size. Detecting signals that weak, however, is no game for amateurs (ie. those not experienced in such endeavors) and such a test without a good knowledge foundation might proclaim an area 'free of puddles' when in truth a slightly larger antenna, or slightly more experience, would locate perfectly usable signal levels.

The Tahiti experience with signals there one day (and stable while there) and gone the next suggests that such tests need to be performed over a period of days; a 24 hour check is not adequate since you could easily set up on an 'off day' and miss the presence of signals in the process.

Finally, it should be obvious that only the best in equipment (high quality receivers, low noise LNAs) will produce results and even after you conduct your tests, you will probably be planning a terminal in the 30 foot region if you wish to leave behind suitable medium (or better) quality signals for serious, routine viewing.

Good luck, and CSD invites your feedback on what **you find** in your own 'puddle jumping' efforts!

PIONEER'S PIONEER NUMBER TWO: ROBERT TAGGART

PIONEER Number Two

Whereas our July Pioneer's Pioneer nominee **Robert Coleman** of Traveler's Rest, South Carolina contributed a great variety of technology to a young, budding industry, our nominee this month has had his inspiration 'in spurts'. His major contributions have been related to antennas and antenna structures and virtually everyone will be surprised, and we believe pleased, when they learn that **the first real breakthrough in low-cost antennas** was the work of **Bob Taggart.**

The concept of naming seven people who have been instrumental in building our industry's foundation is slightly different than naming people to a (Baseball) Hall of Fame. In baseball, the rules are pretty much established and those who are named to the Hall of Fame receive that honor because they have demonstrated unusual skills **within the framework** of a set of rules. The early TVRO years had no rules, and our nominees for this special industry-wide recognition were, in effect, creating the ground rules for an industry that was, in many instances, not yet born. Taggart's contribution pre-dates all other contributions, and the contributors, who will ultimately be named in this awards program. Some history is relevant.

Most know Bob Taggart as the chief operating officer for **Chaparral Communications;** the innovator in antenna feeds for the (home) TVRO industry. Together, with the multi-talented Taylor Howard, Taggart has done something very unusual in any industry; his company has captured so much of their particular market niche that virtually no other firm has been able to make even a measurable dent in the feed business (see **CSD** for July 1984; **page 13**). Taggart comes out of the Stanford University school-of-TVRO; a school largely centered around Taylor Howard when he was a professor at Stanford. It was at Stanford that the first ground rules for TVRO were created, way back in 1970 (!). Taggart played an important part in the early work.

The project began when NASA wanted to show developing nations how a satellite communications system could be utilized to rapidly advance a nation into the 20th century. NASA felt that instructional television was a key part in the creation of an advanced social-

PIONEER TAGGART/ continues on page 30

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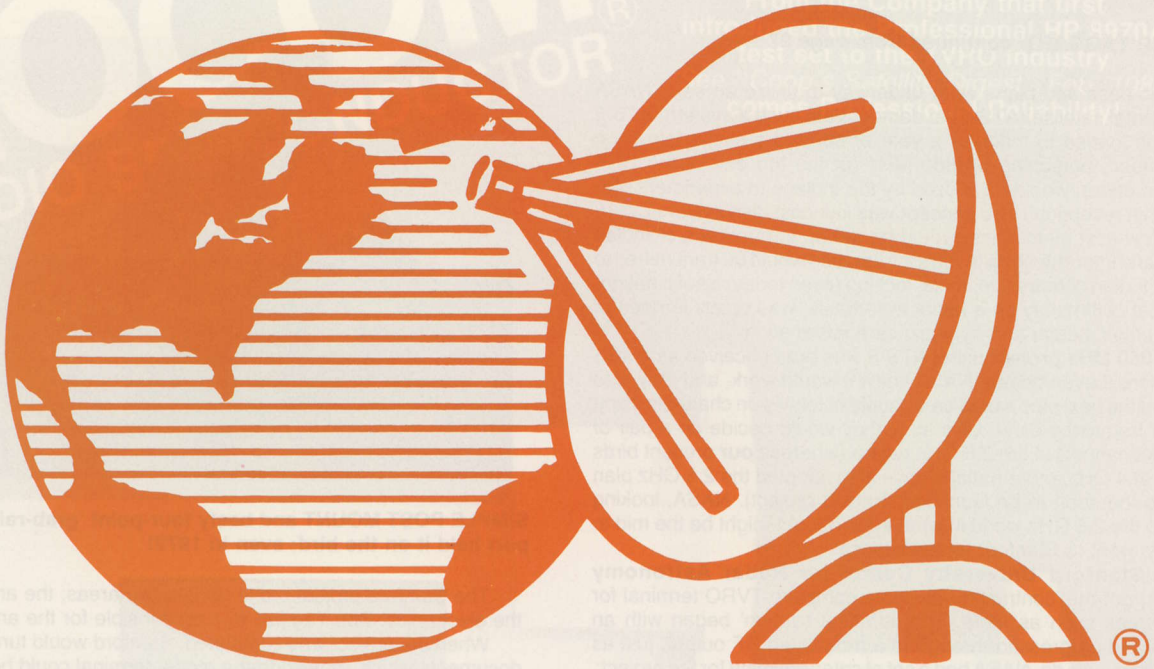

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PIONEER TAGGART/ continued from page 27

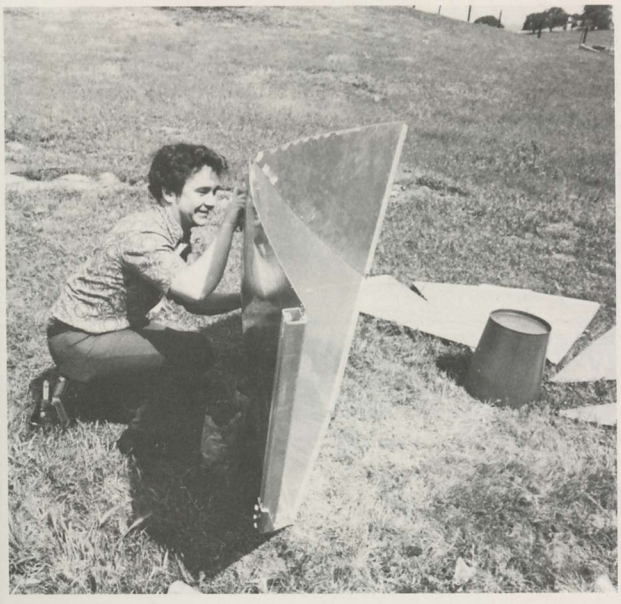
economic base and plans were underway to utilize an early NASA experimental satellite (ATS-6) to demonstrate such a system. ATS-6 was to be loaned to India for a year or so, and a single television 'transponder', outputting on 860 MHz (at the top end of the UHF television band), would be utilized by the Indians to experiment with 'communal reception'. The concept was low-cost dish systems, coupled to low-cost electronics, would be set up in hundreds of Indian villages and important health-care information would be transmitted to the rural Indian countryside. India, lacking (even today) a solid national medical community on a nationwide basis, was sorely in need of 'do-it-yourself' health and hygienic care information.

The 860 MHz project using ATS-6 was pre-conceived as a success before it even began. NASA knew it would work, and they also knew that the next step would be a couple of television channels using a higher frequency band. Ultimately they would decide on a pair of downlink channels in the 2.6 GHz region (whereas **our** present birds operate at 4 GHz, other nations have also adopted the 2.6 GHz plan including the soon to be launched Arabsat project). NASA, looking ahead to the 2.6 GHz world in what they thought might be the mid to late 70's, went to Stanford for assistance.

The **Stanford University Center for Radar Astronomy** (SUCRA) got the 'contract' to design a complete TVRO terminal for use in areas such as India. The 'terminal system' began with an antenna and progressed through to a modulated RF output, just as present terminals do. NASA had a set of criteria in mind for the project:

1) The downlink would operate on **2620 MHz** (2.62 GHz), nominally;
2) The EIRP would be **51.7 dBw** at boresight (our present day best-level from SATCOM and Galaxy birds is in the vicinity of 41 dBw);
3) The modulation format would be **FM** (so is ours) and the transponder bandwidth would be **25 MHz** (ours is nominally as much as 36 MHz);

NASA wanted complete terminals, as 'cheap' as possible, and with the 1970 state of low noise front ends, that ruled out LNAs; period. NASA in particular wanted the antennas to be seven feet in diameter or smaller, and designed so that they could knock down for shipment in a very small container and be field assembled with normal hand tools requiring no special skills. They also believed that the antennas should use construction techniques and materials which would be readily available in underdeveloped nations; India in particular.



TEN PANELS in all; a 'younger' Bob Taggart demonstrates the assembly process.

SIMPLE POST MOUNT and beefy four-point 'grab-rail' rear support held it on the bird; even in 1972!

The Stanford project broke up into two areas; the antenna, and, the electronics. Bob Taggart was responsible for the antenna.

When the project was completed, Stanford would turn into NASA documents which showed that a model terminal could be built in the United States (using U.S. labor rates and material costs) for $122. That's it; one hundred and twenty two dollars for a seven foot antenna, feed, mount, **and** a single channel receiver! To attain that kind of price, Stanford said 100,000 terminals per year would have to be built. The antenna part was the least expensive segment; under Taggart's lead, it came in at **a total cost of $35!**

The antenna Taggart and crew created was unique. It established the ground rules for every TVRO antenna that would follow over the next decade or more; at least all of the metal (and ultimately screen mesh) antennas. Several patents were requested and issued and Taggart retained an ownership right in the patents. Anyone building antennas such as those to be described owe more than a debt of 'pioneering' to Robert Taggart; they possibly also own him some royalty payments for antennas!

THE Taggart Petal-bolic

The Taggart/Stanford design broke the seven foot diameter dish down into segments. Until Taggart's work, all dish antennas were spun or hand created using expensive labor intensive techniques. Taggart calculated what the 'gain penalty' would be if the dish surface was not totally parabolic all over. He found that if the designer was willing to accept a 2-4% efficiency trade off, and use a quantity of segmeted **'flat petals'** in lieu of the fully parabolic-contoured petals or pieces universally employed at the time, the cost of the antenna could be cut to a fractional number.

For the seven foot version, ten flat metal petals were created. They shipped flat, and mounted into an extruded aluminum angular frame. The individual **flower-like-petals** 'snapped' into position for all ten surface pieces and the back of the dish was supported at four points by a 'grab rail' type of mounting system. The dish installed on a simple post mount.

All of this seems exceedingly familiar to present day users of 4 GHz technology. You see it and yawn because everybody does it. 'Nothing very clever about that' you think to yourself.

In 1970, nobody had ever done anything even remotely similar to this; Taggart and crew had no reference library to pour through to show how others had worked out the same problem. The U.S. Patent Office agreed in granting the patents for the antenna system.

The time-table for NASA's vision of creating a national satellite system for India (or other 'underdeveloped' nations) slid. NASA's input, valuable to India, ultimately would be used by the Indians (and Arabs) as they would eventually create their own (2.6 GHz) educational/instructional television networks. But for Taggart, a long, dry spell would follow.

PIONEER TAGGART/ continues on page 34

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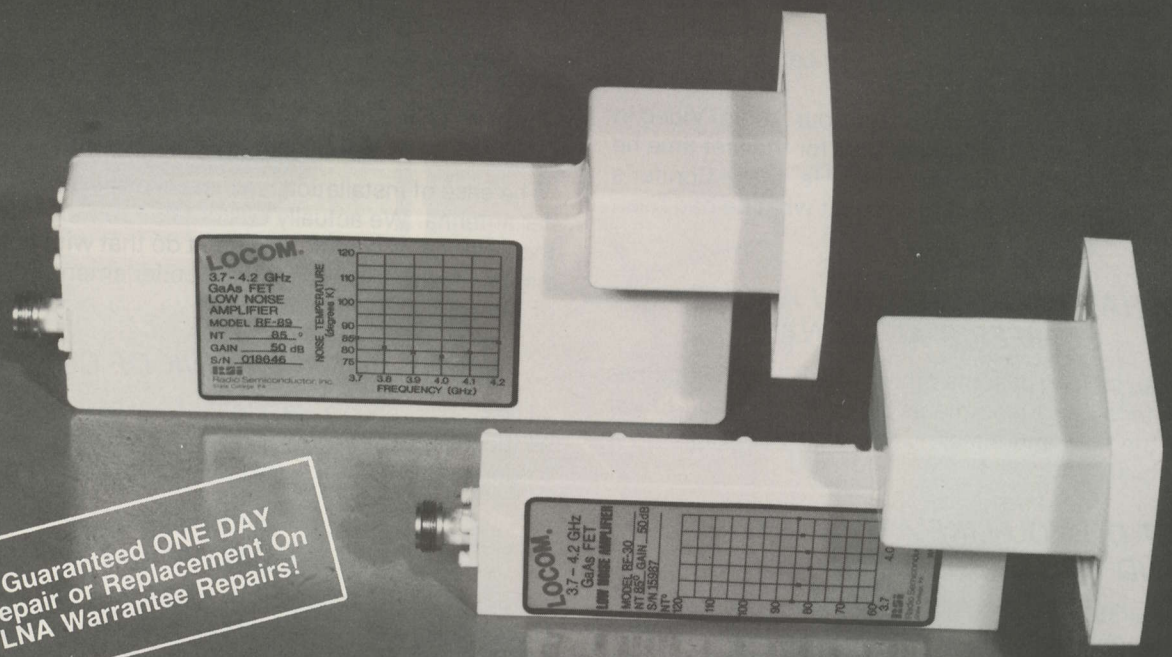

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"We're right on the ocean and we have installed several Conifer antennas close to the shore. One is located on the roof of a house and is exposed to salt spray off the ocean. The Polymer coating and the stainless steel nuts and bolts protect it from rust and corrosion."

WHAT ABOUT DURABILITY?

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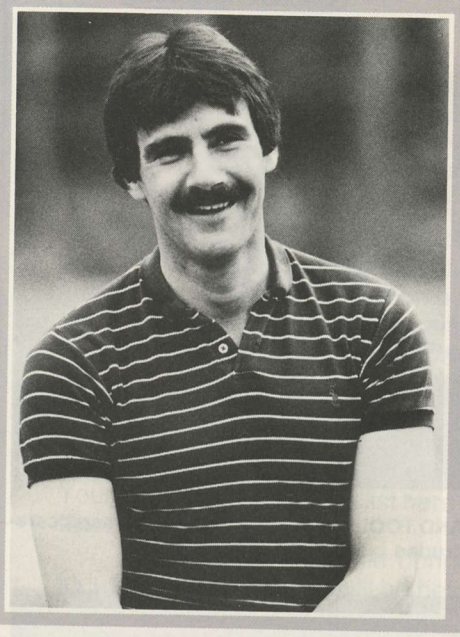

"Microwave Specialty Corporation has range tested the (Conifer) AN1200 Micro-Grid twelve foot aluminum reflector with a Polarotor I ™ Feed. Test patterns indicate...side lobes of less than 18 db and 1.4° beamwidth will provide normal satellite receive signals. This normal antenna performance would be inclusive of operations at the eventual planned 2° satellite spacings.

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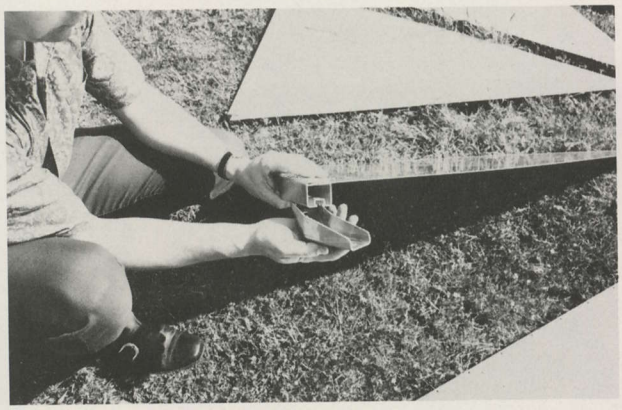
PIONEER TAGGART/ continued from page 30

With NASA and India dragging their feet, Taggart and crew filed their patents away and went to work in other fields. Those who were into researching obscure technical papers would discover the Taggart/Stanford work periodically through the 70's. It would be the April 1978 issue of **CATJ Magazine** before the work was uncovered and given widespread international recognition. There, an article written by Coop, revealed the design and system to a just emerging TVRO world. From that publicity, and interest, a number of small firms tracked down Taggart and got him thinking about the nearly ten year old design work once again.

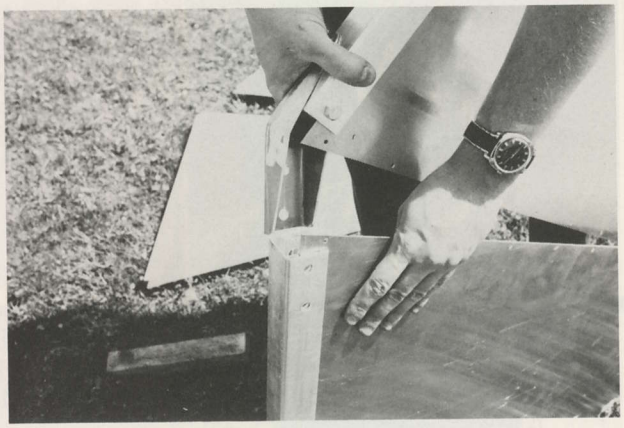
Taggart's work in this area has been recognized, only briefly, on two occasions in our industry. At the Miami (February 1980) SPTS show, Bob Taggart appeared on a panel to discuss low-cost antenna design. It was at the same Miami show that Jamie Gowen of ADM first displayed the basic 11 foot ADM antenna; a 'petal-bolic' created in the same fashion and form initially constructed by Taggart and helpers back in 1970. **ADM was the first in our industry** to exploit the Taggart technology although others such as U.S. Tower, R.F. Systems, Mark Products and even Scientific Atlanta had uncovered the original Taggart work some years earlier.

The next time Taggart displayed his antenna technology was at the San Jose (July 1980) SPTS show. For this show he brought out a larger model of the NASA funded/Stanford created petal-bolic dish, and hundreds of show goers could touch and inspect and study the design. Dozens of new antenna firms would be starting up business shortly thereafter, using some or all of the basic Taggart created concepts.

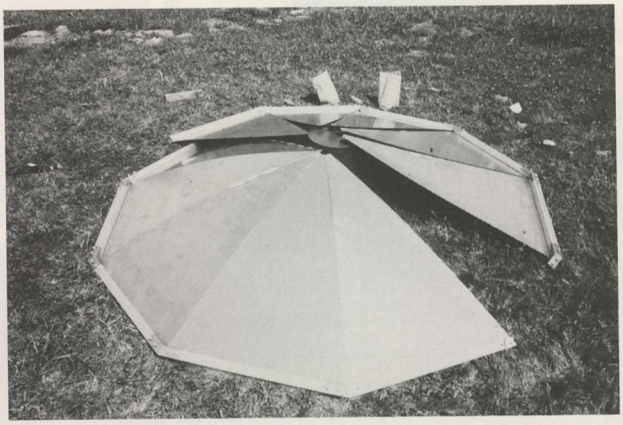


EXTRUDED OUTER RIM formed the 'wrap-around' assembly to hold the surface together.

TAGGART IN 1972 didn't yet know about 'scalar feeds' but he did understand metal forming!



ONLY COMMON HAND TOOLS was the NASA requirement; carefully machined, extruded pieces was the solution.



RAISED CENTER using a 'support tub' **during the assembly process was procedure adopted later by ADM for their 11 foot antenna.**

Taggart's interest in the petal-bolic antenna approach never really stopped. But, it was at the same San Jose show that Taggart, in a newly formed partnership with Taylor Howard, introduced the first Chaparral product; the 'Super Feed'. And as everyone now in the industry knows, the Chaparral feed(s) shortly became an industry standard, consuming all of the available time and energy of Bob Taggart. The petal-bolic antenna system was dropped as a viable product but others quickly appeared to pick up the 'baton' and run with it.

TAGGART'S Contribution

There is a saying in business that the 'first-in' with a new product or concept usually gets burned. The first-in is usually an innovator, a person with an idea or concept; perhaps an inventor. Very few 'inventors' have the required assets or business sense to make real bucks with their product. Those that do succeed usually go to outside sources for assistance in putting together a 'company' to manufacture and market their conception. Taggart was no exception to this 'rule'.

What he left behind was a richly documented series of technical papers, published hither and yon, describing **a brand new approach** to low cost (TVRO) parabolic antenna technology. Most of those who would reference those papers in their own research would scarcely notice the names of the inventors nor connect **that** 'Taggart' with **'the Taggart'** we now all know today as 'Mr. Chaparral'.

Bob Taggart never made a dime from petal-bolics. He gave the project several years of his life, and after the initial burst of enthusiasm

PIONEER TAGGART/ continues on page 38

WHO ARE THE INDUSTRY'S SEVEN "PIONEER'S PIONEERS"?

THE CONTEST Goes On/ Month Two!

The purpose of the contest is to identify the seven people whom you feel are being selected as industry "Pioneer's Pioneers." Last month we identified **Robert Coleman** of Traveler's Rest, S.C. as 'Pioneer Number One.' This month we have identified **Robert Taggart** as 'Pioneer Number Two.'

For each pioneer, there is a special 'Pioneer Print,' an 11 by 14 frameable litho-print which is free to you, the TVRO dealer, merely for following our instructions here. You obtain the 'print-of-the-month' by completing this print-request-form and sending it off to Boman Industries which is picking up the costs associated with distributing the prints.

There will be seven "Pioneer's Pioneers" in all **and** eight prints. We have now identified two of the seven. Your job is to complete the list here with five additional names and turning this list into Boman Industries **no later than August 31st.**

AHEAD, in Nashville during the combined STTI/SPACE show on September 3rd a gigantic 'TVRO Industry Birthday Party' will be held where all seven of the Pioneers will be identified. During the course of the one-hour-long Birthday party, those who have correctly guessed or have come closest to correctly guessing the identity of the seven Pioneers will have the opportunity to have their name selected for a dealer prize; a five day all-expense-paid trip to the Turks and Caicos Islands, this winter, for two people!

THIS Month

Complete the five blanks here by guessing whom you think will be announced in Nashville as 'Pioneers.' Also complete the three marketing survey questions and fill in your name and address. Return the form (an office machine copy **is** a valid entry; no reason to deface **CSD** in the process!) to the Boman address given below so it arrives no later than August 31st. If your entry is 100% correct, or as close as anyone else, your name will go into a 'hopper' from which the winner will be drawn during the Industry Birthday Party on September 3rd in Nashville. My guesses are:

1) **Robert Coleman**
2) **Robert Taggart**
3) _____
4) _____
5) _____
6) _____
7) _____

MARKETING Survey

1) Do you feel that an industry-wide project to 'certify' professional TVRO dealers, as a means of identifying the professionals so that consumers can buy from such dealers with greater confidence, is a worthwhile endeavor? _____

_____

2) What TVRO **programming** publications do you routinely acquaint your consumer-customers with?

_____

3) Do you object to program-guide publications carrying advertising which is intended to sell equipment **below** established retail price levels? _____

YOUR Entry/Request For Taggart Print:

By returning this August 1984 issue form, you will automatically receive a copy of the limited-edition Industry Pioneer litho-print featuring Robert Taggart.

NAME _____

COMPANY NAME _____

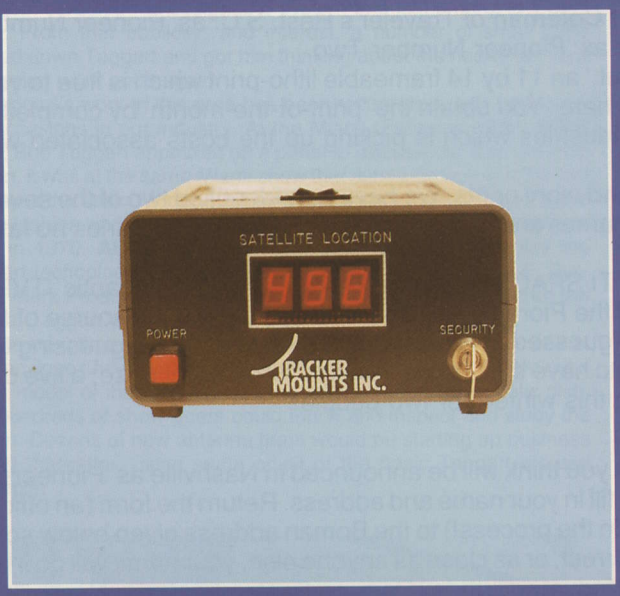
Address _____

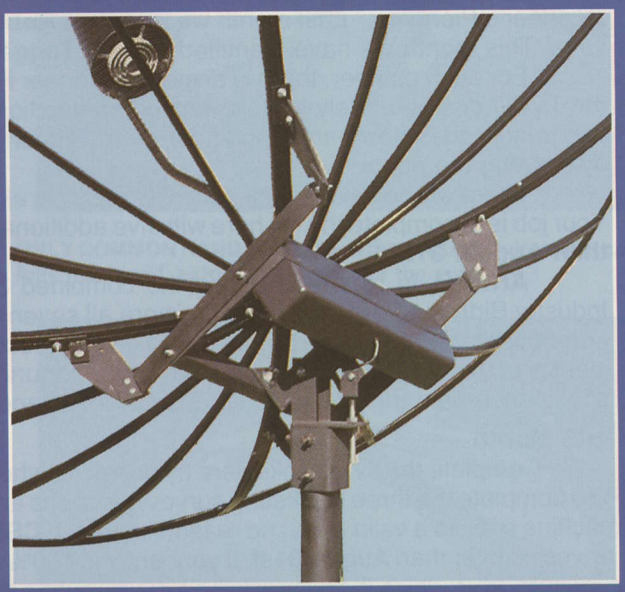
Town/City _____ State _____ Zip _____ Telco _____

Return your entry and print request form to:
Birthday Party
BOMAN INDUSTRIES
9300 Hall Road
Downey, California
90241

HORIZON TO HORIZON

Expand your tracking systems market.





*Complete System

$365.00

Tracker Mounts™

Now you can sell one more horizon than your competitor with the Tracker Mounts™ system. This is the industry's first patented worm drive mount. The Tracker Mounts™ system eliminates bent actuator arms and weather damaged motors. Tracker Mounts™ has revolutionized tracking system standards with horizon to horizon tracking. The complete TM 101 System includes Digital Control, Mount and Pole.

Dealer Pricing

1	$595.00	10-24	$390.00
2-4	$450.00	25 plus	$365.00
5-9	$415.00		

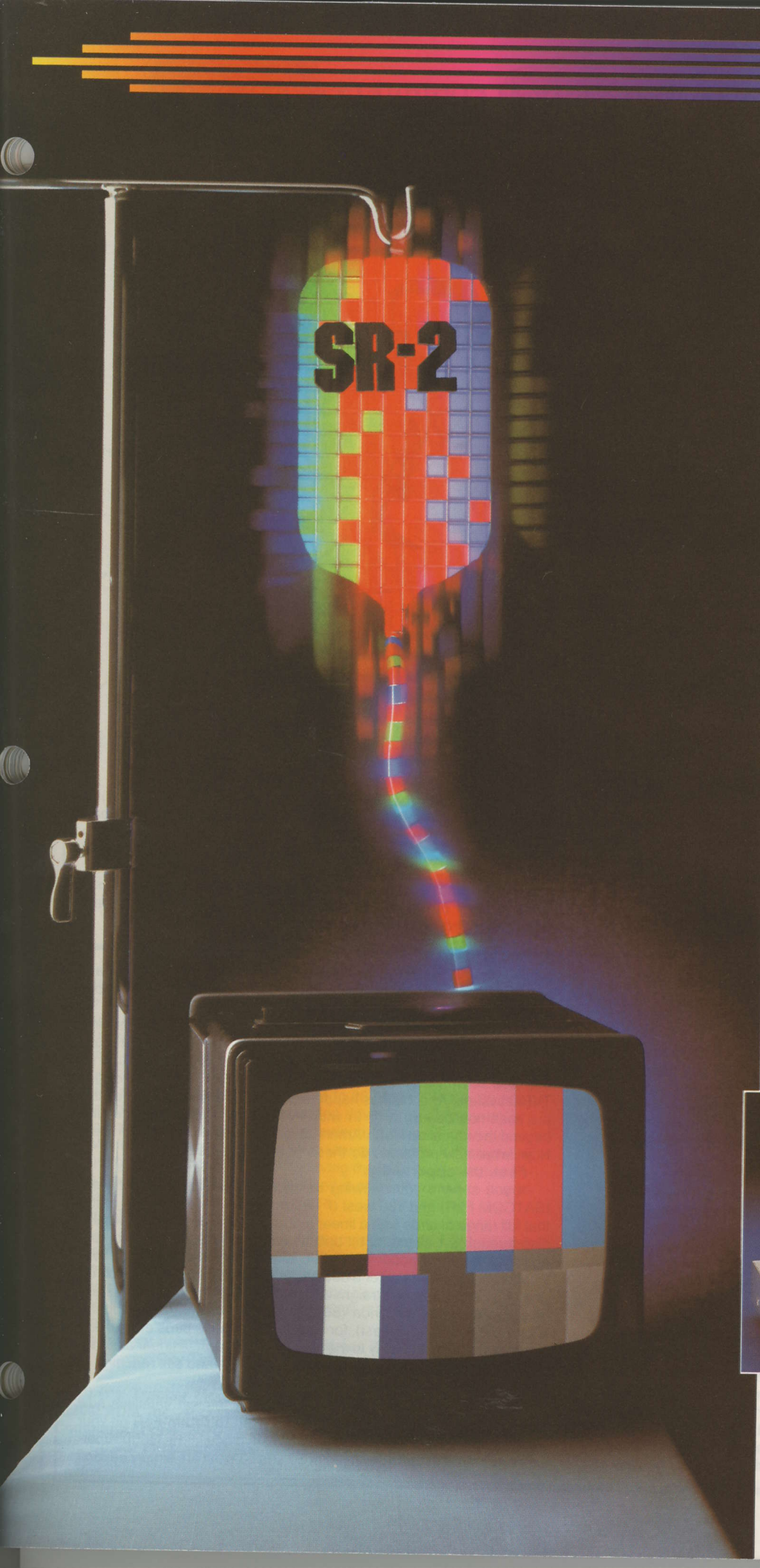
*25 Lot Price FOB Little Rock

"WE WON'T JACK YOU AROUND"

Tracker Mounts, Inc.
5720 S. University
Little Rock, AR 72209
501-565-5402

TRACKER MOUNTS

Write or call today for Dealer pricing and information to expand your tracking systems market.



The SR-2. Advanced therapy for a healthier picture.

Your customers want a proven prescription for a crisp, clear picture with distortion-free audio. Now you can give it to them with the new second generation SR-2 Receiver System. It's the breakthrough **Rx.**

The SR-2 contains a breakthrough ingredient we call LPLL, the Linear-Phase Lock-Loop Circuit. In the past, LPLL has been found only in commercial electronics. But now, LPLL is the key in providing the video demodulation necessary for a brilliantly healthy picture, noise remission and improved threshold performance.

The SR-2 also relieves other annoying reception symptoms your customers may experience. Our Automatic Video-Gain Control maintains consistent picture brightness no matter what transponder is selected. And the Priority Polarity Control provides maximum signal strength.

For happy customers with a healthy outlook on satellite reception, give a dose of the SR-2. It's a totally integrated electronics package, including remote control that's user friendly in operation and installation.

To give the SR-2 your own personal examination, call us today at (800) 328-7733. In Minnesota, (218) 681-5616.

UNITED SATELLITE SYSTEMS USS™

St. Hilaire, Minnesota 56754

PIONEER TAGGART/ continued from page 34

from NASA, witnessed his pet project slide into oblivion. When a modest amount of re-interest surfaced in 1978, he was cautiously optimisitc about where it might lead. He came close to licensing others to utilize his technology during 1978 (and 1979) but when it didn't work out, he found himself back in contact with Taylor Howard who was just then getting deeply involved in TVRO himself. And from that relationship, Chaparral would grow.

All of the industry owes Bob Taggart, and the balance of the Stanford University Center for Radar Astronomy, a debt. **Their technology** made it possible for the home TVRO industry to spring from a sprout to a full-fledged seedling because without 'low cost' antennas the industry would never have begun. The next time you run into Bob Taggart at an industry trade show, walk up and 'thank him' for making the industry you are now a part of possible. Bob Taggart; **a "Pioneer's Pioneer"!**

CONTEST and RULES:

1) This contest is open to **all readers of CSD;** you need **not be** a subscriber to enter.

2) You are entitled to enter once per month using either the form appearing here or a machine-office copy of this form.

3) Seven individuals have been selected as major contributors to the growth of our industry. **Robert Coleman** was identified as the first of the seven in our July, 1984 issue; **Robert Taggart** is identified as the second of the seven in this issue. Your task is to correctly guess the remaining five.

4) Your entry for this month **MUST be** in the hands of Boman Industries **no later than August 31st.** At that time, all of those with seven correct answers, or all of those with the number closest to seven correctly identified, will be placed into a 'hopper.' That hopper will be taken to Nashville for the joint STTI/SPACE trade show September 3/4 and 5.

5) In Nashville, **on September 3rd only,** you will have one more opportunity to correctly guess the seven people. Stop at EITHER the **Boman Industries** booth space (booths 544 and 546)**OR** the **CSD** booth space (booth 1012) where you will find additional entry blanks. **You may enter at Nashville one additional time.**

6) CSD and a group of industry firms are sponsoring a gigantic industry birthday party at 6 PM on the 3rd. Everyone is invited and it is free! During the birthday party, the 'program' will announce one-by-one the full roster of seven industry 'Pioneers' and each will be presented with a special award. At the end of the program, those who have correctly guessed all seven, or those who came closest will then be narrowed to a single winner (by random drawing).

7) That winner will receive an all-expense paid five day vacation, this winter, to the Turks and Caicos Islands in the Caribbean to visit the CSD testing facility and to tour the WIV operation; **courtesy of Boman Industries and CSD Magazine.**

EXTRA CHANCE To Win

Each entrant is entitled to enter the contest **once per month.** You now know TWO of the seven Pioneers. In our September issue, which

will be available in the CSD booth (and selected other booths) in Nashville, you will learn the identity of the **third** Pioneer. On September 3rd **only,** at the Boman Industries booth or the CSD booth (booths 544/546 and 1012 respectively) you may ALSO enter **one final time.** With three of the seven identified at that point, you only have four to correctly guess! **Increase your chances of winning** . . . make it a point to seek out the CSD and Boman booths on opening day, **September 3rd, in Nashville!**

TVRO MOUNTS Part Two

FINDING True Tracking

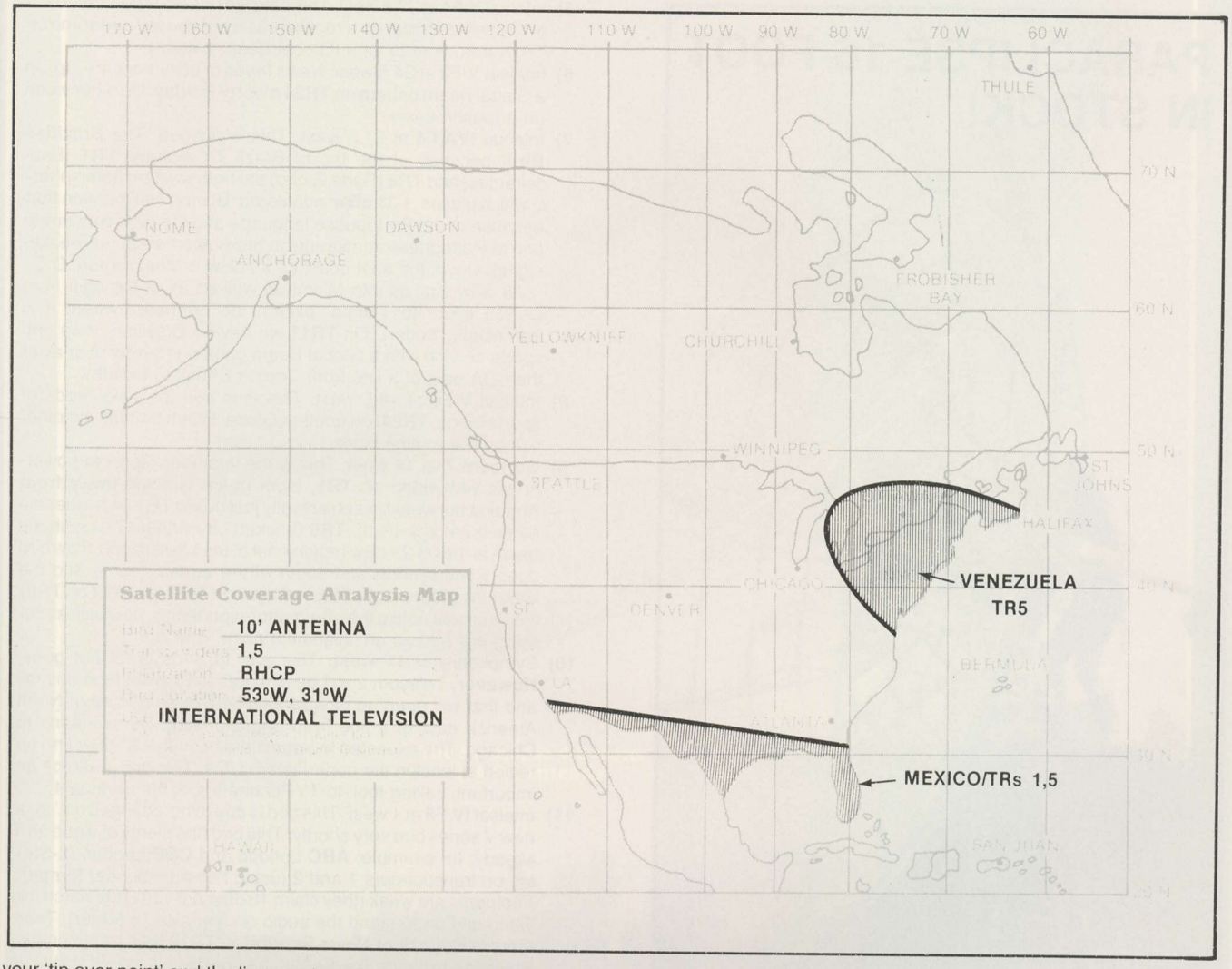
In our first installment dealing with mounts (June 1984 **CSD**) we identified the common parts of the mount and noted that a large percentage of the systems installed lack the ability to properly track the full orbit belt (defined to **this point** as from F4 to F1R, or the North American domestic arc). We also noted that there is a built-in error that cannot be resolved with any polar type mount, no matter how perfectly it functions; that error being the result of polar mounts as a 'design family.' However, we also learned that such errors can be kept to within ±0.1 degree for at least the North American portion of the arc and such an error will not be noticed with dishes that are in the 20 foot and down size class except by absolute perfectionists.

Accepting that the polar mount is 'not perfect,' but also accepting that it is a far more convenient system than the alternative (Azimuth over Elevation or Az-El mounts), the industry has proceeded to turn its attention away from mounts and to more 'exotic' segments of the TVRO system. And this has happened at about the same time as the arc itself has begun to fill in with TVRO-level signals at locations beyond the so-called North American portion of the Clarke Orbit belt. Now, what new problems do these new birds present to us?

First, the opportunity.

If you confine your viewing to birds located between 72 west (SATCOM F2R) and 139 west (F1R), most U.S. locations can reach that full range of birds with a linear actuator which pushes or pulls the dish through the Clarke Orbit belt. There are exceptions to this rule and they begin to occur when you are so far east with your own location that the birds extend down to your western visible horizon on one side, and past the straight-up (overhead) point on your eastern side. From southern Florida (80/81 west) to the central Caribbean (Port Au Prince is 72.5 west), for example, you have birds east of due south as well as all the way to the horizon to the west. A linear actuator has some difficulties pushing beyond due south and still reaching to 'the ground' or western horizon in one motion.

If you expand your viewing to the pair of Intelsat satellites now located at 50 and 53 west, and you **still wish to retain F1R** on your western edge, you have a problem from anyplace in the North American region; the eastern sky birds at 50 and 53 west are simply beyond



your 'tip over point' and the linear actuator cannot cover such a wide range. One solution is offered by Tracker Mounts (*); a worm-gear drive system that moves the antenna through virtually the full arc from horizon to horizon in one, smooth motion.

Other options are offered by ADM (**), Hero (**) and Paradigm (**); this trio of firms offer various forms of horizon to horizon tracking packages with antennas that are from 10 feet (Hero) or 16 feet (ADM and Paradigm) upwards in size (ADM to 20 feet; HERO to 30 feet). Between a retrofitted horizon to horizon drive (Tracker Mounts) or a factory built antenna system with a horizon to horizon drive system (ADM, Hero, Paradigm) you now have several 'options' for completing a (true) horizon to horizon system. Having the tools available, however, is no guarantee that you will install it correctly or make it work properly for you.

What's There?

Let's first define what programming sources are presently in position 'east of' 72 west, so you have some concept of what your customers may be missing if you select systems for sale which are limited to the common 72/139 (west) portion of the belt.

We'll go east, starting at SATCOM F2R (72 west) as the jumping off point.

1) Intelsat **IVA/F1** located at 53 degrees (*). On board are three Mexico City TV services plus a San Diego (U.S.) service that rotates between the three basic US networks. This bird is visible in all but the north-western USA and it has signal levels in the 31 dBw (SE, south central) to 26 dBw (north central) region.

*/ This bird is scheduled to move east to 50 west before the end of the year and a new Intelsat V bird, carrying traffic to and from Europe will be located here at 53 west. The IVA/F1 bird will continue to carry the Mexican service until the new Mexican bird is launched in 1985.

2) Intelsat **V/F8** at 53 degrees. Use of or loading on this bird is unknown at this time. It has the ability to place signals up to +34 dBw into a spotbeam region selected.

3) Intelsat **V/F2** at 34.5 west. This bird has limited television on board, usually found only on TR24 which is the **standard** 'Global Beam' channel for Intelsat. Global Beam means signals in the 19/21 dBw region, far too weak for dishes smaller than 25 feet.

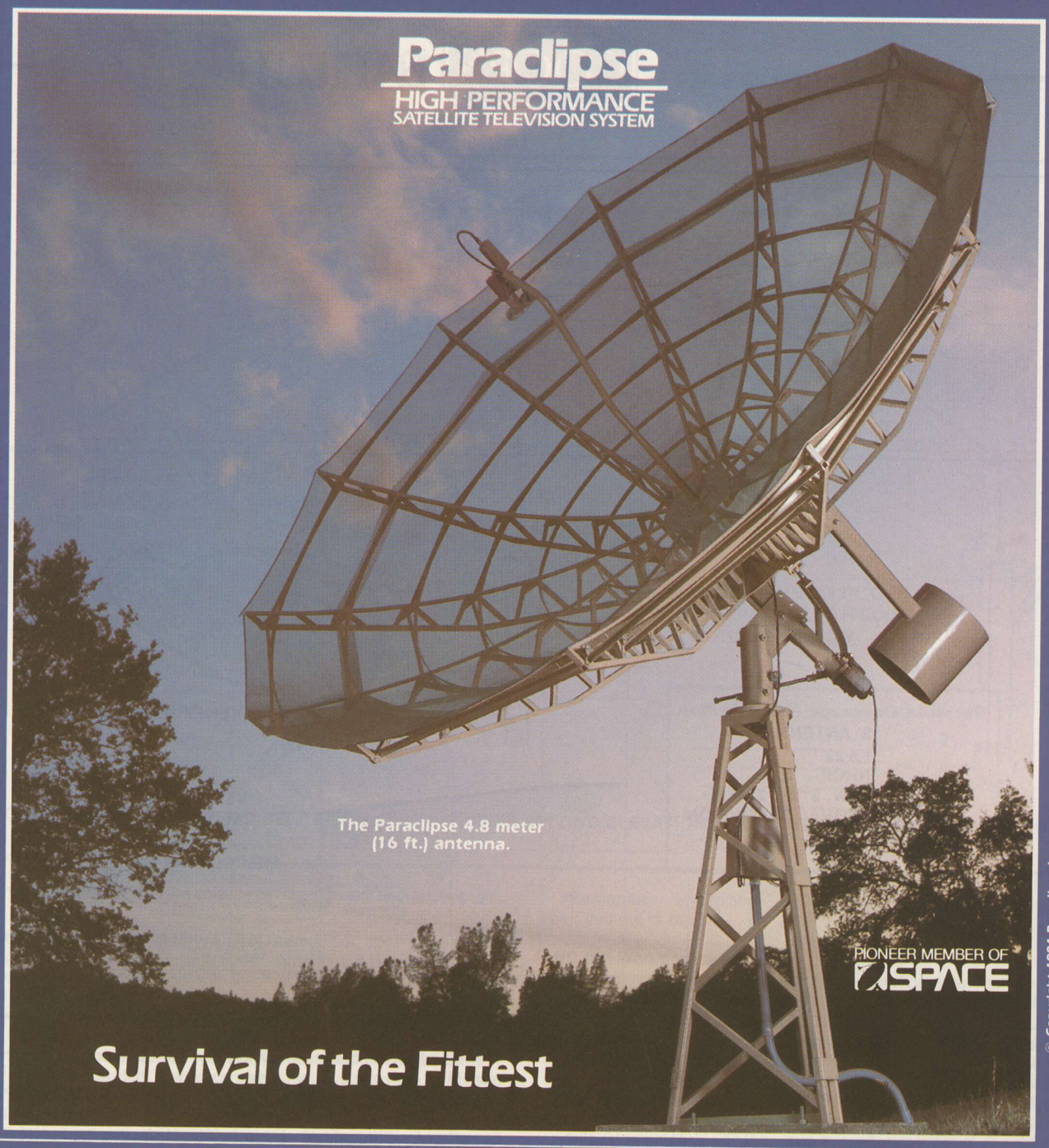
4) Intelsat **IVA/F1** at 31 west. This satellite is something of a 'work-horse' for South American leased video services. Intravision (Bogota, **Colomb** is on **TR1;** Venezolana de Television (Caracas, **Venezuela,** is on **TR5;** RTP-7 (Lima, **Peru**) is on **TR22** while Televisora Color (Buenos Aires, **Argentina**) in on **TR24.** TR1, 5 and 22 are 'western hemispheric' beamed which means you have levels such as 26 dBw (Colombia), 28 dBw (Peru) and 30 dBw (Venezuela) over all of the eastern USA east of a line from Houston to Duluth. Those are not that bad levels! Argentina on TR24 is Global Beam pattern and it is at best 22/23 dBw in the same coverage region.

(*) (**)/ Tracker Mounts, 5720 S. University, Little Rock, Ar. 72209; ADM, Inc., P.O. Box 1178, Poplar Bluff, Mo. 63901; HERO Communications, 2470 W. 8th Av., Hialeah, Fl. 33010; Paradigm Mfg. Co., 3711 Meadowview Drive, Redding, Ca. 96002.

5) Intelsat **V/F4** at 27.5 west. This satellite has **no video on board** at the present time, on a regular basis but you will see some on TR24 from time to time (Global Beam pattern).
6) Intelsat **V/F3** at 24.5 west. News feeds or color bars are 'up' on a Global Beam pattern on TR24 most of the day. No other video on a routine basis.
7) Intelsat **IVA/F4** at 21.5 west. This is dubbed **'The Brazilian Bird'** because of the trio of Brazil TV signals. **TR1** (Bandeirantes) and **TR5** (Rede Globo) are both western hemispheric which places **+31 dBw** signals into Boston (we mention that because of the Portuguese language and the high concentration of Portuguese immigrants in the Boston area) but weaker signals down the east coast (+ 29 dBw in Washington, D.C.; + 28 dBw signals into Miami as well as all of the east from Detroit south to Tampa, except the northeast where it is appreciably hotter). On **TR11** we have a Brazilian news and sports service with a Global Beam pattern (19 dBw over all of the USA east of a line from Corpus Christi to Duluth).
8) Intelsat **V/F6** at 18.5 west. This is in use for news feeds or sports feeds, **TR24,** on another Global Beam pattern. No other video on a routine basis.
9) **Gorizont 7** at 14 west. This is the infamous Russian powerhouse with video on **TR1,** (spot beam directed **away from** America but weakly seen actually just below TR1 on a tuneable receiver, at low level), **TR6** (backed off-northern hemispheric beam in the 28/29 dBw region east of the Mississippi). This bird does wander north and south of the equator some and the larger the antenna (a 13 foot will do it on TR9; a 20 foot on TR6) the more you notice the off-equator-wandering. We'll talk about using this bird as an 'alignment point' later on.
10) Symphonie at **11 west.** This pair of birds is all but gone. **However,** Telecom 2 will be situated at **10 west** later this fall and that will open up direct Parisian television to all of North America east of a line from approximately New Orleans to Chicago. The expected footprints will be in the 30 dBw and up region at least in the northeastern USA. This one could be an important 'selling tool' to TVRO dealers in the northeast.
11) Intelsat **IV/F8** at 1 west. This bird is due to be 'changed out' for a new V series bird very shortly. This bird has plenty of video on it already; for example: **ABC** London and **CBS** London (L-Sat) are on transponders **1** and **2** (using half transponder format). Footprints are weak (they claim 16 dBw but you CAN watch the video and understand the audio on a quality 16 footer). Then there is **Brightstar News Service** on **TR18** (half transponder) which feeds things like the Wimbledon Tennis to HBO (etc.) at a reported 19 dBw level. And there is **TVP/Television Portugal** on **TR19** (full transponder); AFRTS with reported footprint of 21 dBw on **TR24.** All are Global Beam patterns, all have standard subcarrier audio (although the audio on AFRTS is especially 'hot'). This 1 west position is visible from Miami (at horizon) to Buffalo, and east with reasonable look angles in New England.

That is clearly a lot of data to digest. Now, what could you 'see' with various size dishes, assuming a 85 degree LNA and 8 dB threshold receiver? Here is a quick reference table that will equip you with sufficient data to know whether you should be handling a mount and drive system that will go further east than SATCOM 2R at 72 west.

1) **10' Antenna**/ 53 west **Mexico** along southern edge of USA, **Venezuela** from Norfolk NW to upper Michigan, through eastern Canada to Halifax, south back to Norfolk.
2) **13' Antenna**/ 53 west **Mexico** south of a line from Atlanta to LA, Peru **plus Venezuela** in same area outlined for 10' antenna (one, just preceding), **Brasil** from New York City to Montreal, east through Canada to Newfoundland, south along coast back to New York City; Russian TR9 east of a line from New Orleans to Chicago.
3) **16' Antenna**/ 53 west **Mexico** south of a line from Norfolk to LA, **Venezuela** east of a line from Corpus Christi to Duluth, **Peru** east of a line from Charleston to St. Louis to Chicago to upper Michigan and east to the coastline; **Brasil** east of a line from Miami to Detroit, and due north to Hudson Bay; **Russian TR9** east of a line from New Orleans to Chicago.



It's a tough world out there. Every minute of every day the effects of wind, rain, heat, cold and corrosion will do their best to defeat your investment.

If your system is to survive and perform accurately day after day, year after year, you will need to start out with equipment strong enough to endure nature's worst.

The famous Paraclipse design rib and ring truss system is simply unequaled in terms of rigidity, strength and parabolic symmetry.

The antenna framework is a precision welded aluminum alloy structure covered with heavy expanded aluminum mesh. The result is a strong, lightweight, dimensionally stable mesh reflector that is capable of supporting the kinds of loading that a solid dish would impose.

The hub assembly, polar drive, pedestal mount and counterweight are all fabricated from steel. Precision tooling and manufacturing techniques enable the 4.8 meter Paraclipse to track from horizon to horizon and from zero to 90° elevation with perfect, dead center accuracy.

Our counterweight assembly offsets the forward weight bias imposed on the polar tracking mechanism. By placing a mass equal to that of the reflector behind the polar T, we've greatly reduced the demands placed on every component of the drive system. With the drive disconnected, the entire superstructure swings smoothly to the center position and can easily be moved by hand to any position in the arc.

Every part is powdercoated with a beautiful baked-on epoxy finish that effectively seals the antenna from the elements. The entire assembly is put together with stainless steel bolts, nuts and fasteners.

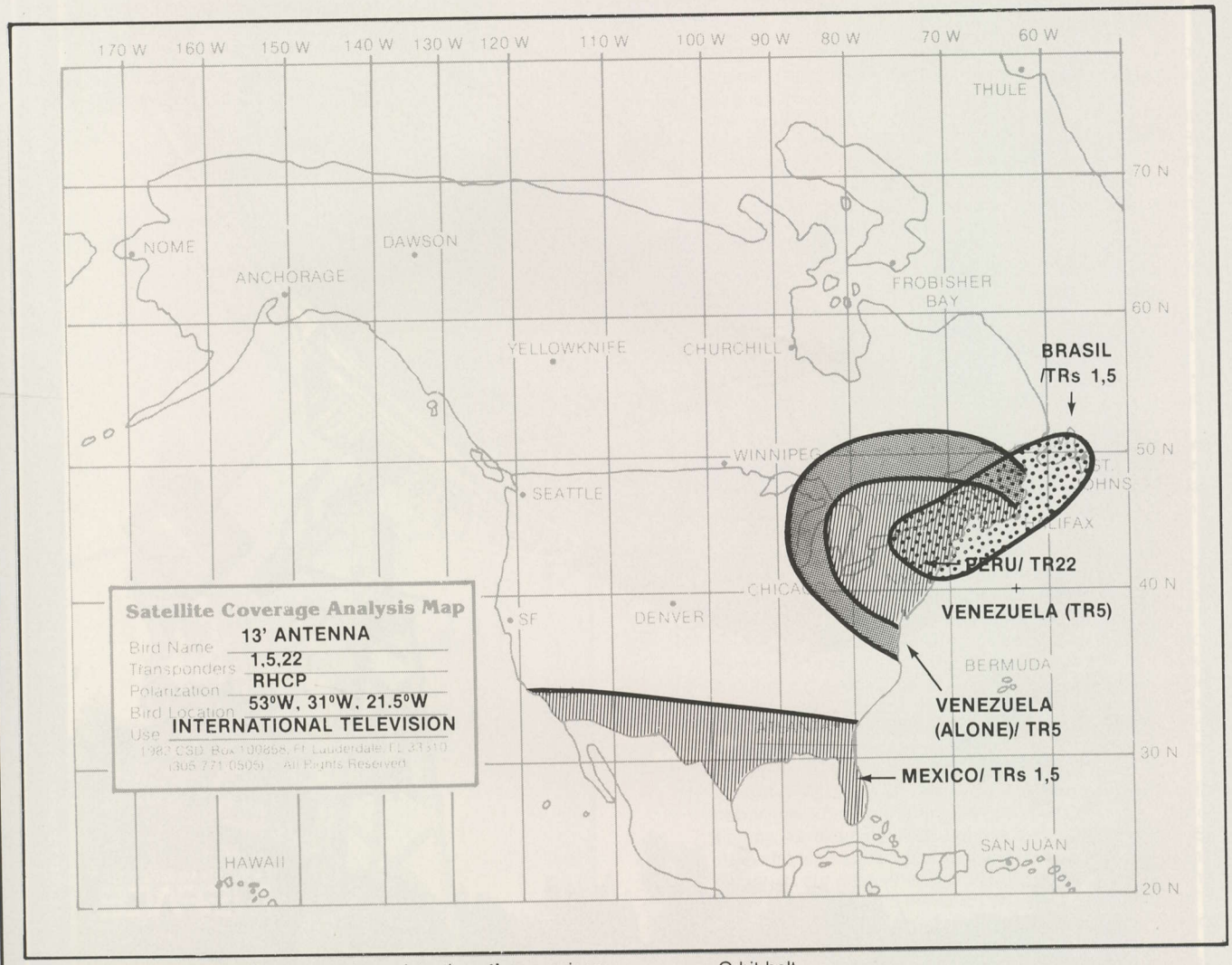
We're so confident in the way we build the 4.8 meter Paraclipse that we guarantee it for three full years against wind damage. That's right, a three year unlimited wind speed warranty. If it is damaged by wind in the first three years, we fix it. You are protected right up to, but not including an offically declared disaster.* We are that confident.

You will want your investment to last. You will want your equipment to perform. You will want accuracy and reliability for a long, long time. And you will want all of these things at a reasonable price from a manufacturer who will stand squarely behind his products.

At Paraclipse we think you deserve no less.

Paraclipse Inc. 3711 Meadowview Drive, Redding, California 96002 (916) 365-9131 244-9300

* Full warranty information available upon request.



Larger antennas will of course get you into the **other** services mentioned. So is it worth it? Knowing that you COULD offer these additional services, such as Portuguese television from both Portugal **and** Brasil to people who speak the language and/or have that heritage certainly opens up new, additional marketing opportunities. But, the dish you install, regardless of size, must be capable of **tracking** the eastern side as well as the western side; and with greater accuracy than you probably have today with your west-only drive system(s). Let's see what that is all about.

LINEAR Drive Set-Up

There are almost as many dish tracking techniques as there are people installing antennas. No technique is foolproof and EVERY technique is confusing to somebody who has not done it previously. It is still possible for someone to spend **days** finding their first satellite signal; it is also possible for people who have experience to turn the system on, dead-on a satellite. Between those two extremes is nothing more, nor less, than experience.

All polar mount systems have the following characteristics in common;

A) The dish has two and hopefully three 'adjustments';

B) One of those adjustments allows you to set the dish at the proper **declination offset angle** (see pages 11, 12, 14 and 16 for **CSD:** June 1984).

C) Another of those adjustments allows you to adjust the **dish elevation** or look-angle.

D) A third adjustment allows you to move the dish **left or right,** or east and west, to hopefully track along and through the Clarke Orbit belt.

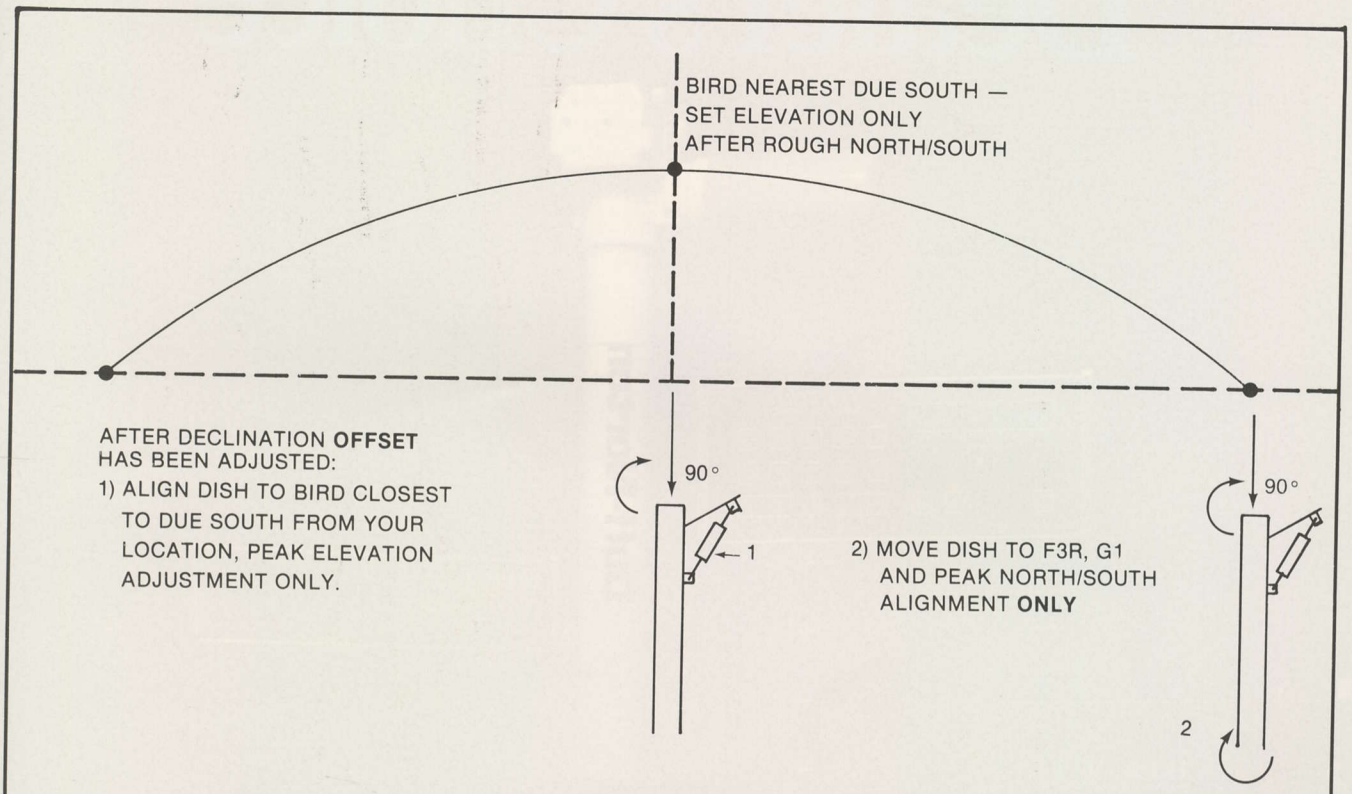
You adjust the declination offset first, before attempting anything else. Most dish or mount packages come with instructions telling you how much 'offset' your dish requires for your particular latitude. People who **claim** their dishes **do not require** custom setting of a declination offset for different latitudes are either **(1)** fooling themselves, or, **(2)** attempting to fool you. If you decide the former is true, go find another mount supplier since if they REALLY believe no declination offset is required, that should tell you they are not bright enough to be building mounts and offering them to you for use. They may have a single FIXED offset **for your region** of the country (similar latitudes use similar offsets) and that is OK. **But,** if they REALLY believe the **same offset** works for Miami and Atlanta, or Miami and Chicago. well ... they don't understand what they are doing. And **you** won't get any brighter hanging around them.

Now, what do you do next?

First, we use a compass or surveying tool and we figure out where we believe true north (not magnetic north) really is. We align the appropriate north-end of the mount with where we believe true north is, as a rough alignment.

Second, we use an inclinometer and we set our elevation to the proper number of degrees. Basically, if you are at 35 degrees north, your elevation will also be set at 35 degrees (**plus just a tad**). That is easy enough to remember.

Now, the dish should be pointing towards where you believe your closest satellite will be at a location **due south to you** (ie. if you are at 72 west, you will point at 72 west or due south and there you will find F2R). Of course if you are south of the equator, everything reverses



NORTH AMERICAN DOMESTIC BELT ALIGNMENT REQUIRES SETTING ELEVATION FIRST, THEN NORTH/SOUTH PEAKING

and you point due north at the satellite which is closest to due north for you.

There should be a satellite signal there. If not, and if you are not a long ways 'off' with your north south alignment, it is time to check your elevation adjustment set with the inclinometer again. Here is the basic simplicity of it all:

1) If you can set your elevation **accurately,** and you have previously set your declination offset **accurately,** then to locate a satellite that is due south or close to due south of you, all you do is point the dish due south and gently nudge the azimuth (rotation of the dish drive on the polar mount). A few degrees one way or the other and you should have the satellite.
2) At that point you **leave the elevation totally alone,** and swing the dish to the west towards the lowest bird in your sky. That should be F1R or G1. If you get there and find nothing, leave the elevation adjustment totally alone and **tweak only on the azimuth** (rotating the fill dish itself on the polar mount pipe/stand). Remember, the elevation was set with an inclinometer and it is going to be very close if the inclinometer was true and if your mounting pole/pipe is not out of true.
3) Finding a low-look angle bird, you then tweak first on the azimuth by rotating carefully the **full dish plus mount** on the pipe/stand, and then touch up the dish azimuth drive itself. Now . . .
4) Return to the higher bird and check to see if it is still peaked up. If it is not, leave the dish mount to pipe/stand azimuth alone and tweak ONLY on the elevation adjustment. Repeat this back and forth, adjusting the **elevation** adjustment **ONLY on** the high bird, and the dish to pipe/stand **rotation** adjustment **ONLY on** the lower bird until the dish is tracking through the belt from at least F4 down to F1R.

Never try to get the dish to track by adjusting the elevation control adjustment on a low bird; **never try** to get the dish to track by adjusting the north/south alignment (ie. rotating the dish on the pipe stand) on a high bird. That will screw you up for days!

Remember . . . elevation ='s up; azimuth ='s down. That will keep you out of trouble.

AND If It Won't Track?

The most common problem is that you can get it to track on the higher look angle birds, but you can't get it aligned true north/south so the lower birds stay on track. What is wrong?

A) Most probable; the pipe sunk in concrete or your vertical support for the dish mount is NOT vertical. It may only be off a degree to two, at the top of the pipe stand/bottom of the dish mount. It only takes a degree to two of being 'off' to screw up tracking.

Some people try to use the same inclinometer they use to set their elevation to check whether the pipe stand is true straight up and down. This type inclinometer is at best inaccurate and when you are trying to read a true 90 degree 'plumb' line, you probably cannot read it within ±2 degrees with most such instruments. Invest in an appropriate high-quality Carpenter's right angle finder and use it instead. Remember, if the pipe stand 'leans,' **even just a degree or two,** your entire dish will be 1 or 2 degrees 'off' at the bottom or lower look angles. That's enough to cause you to lose tracking down there.

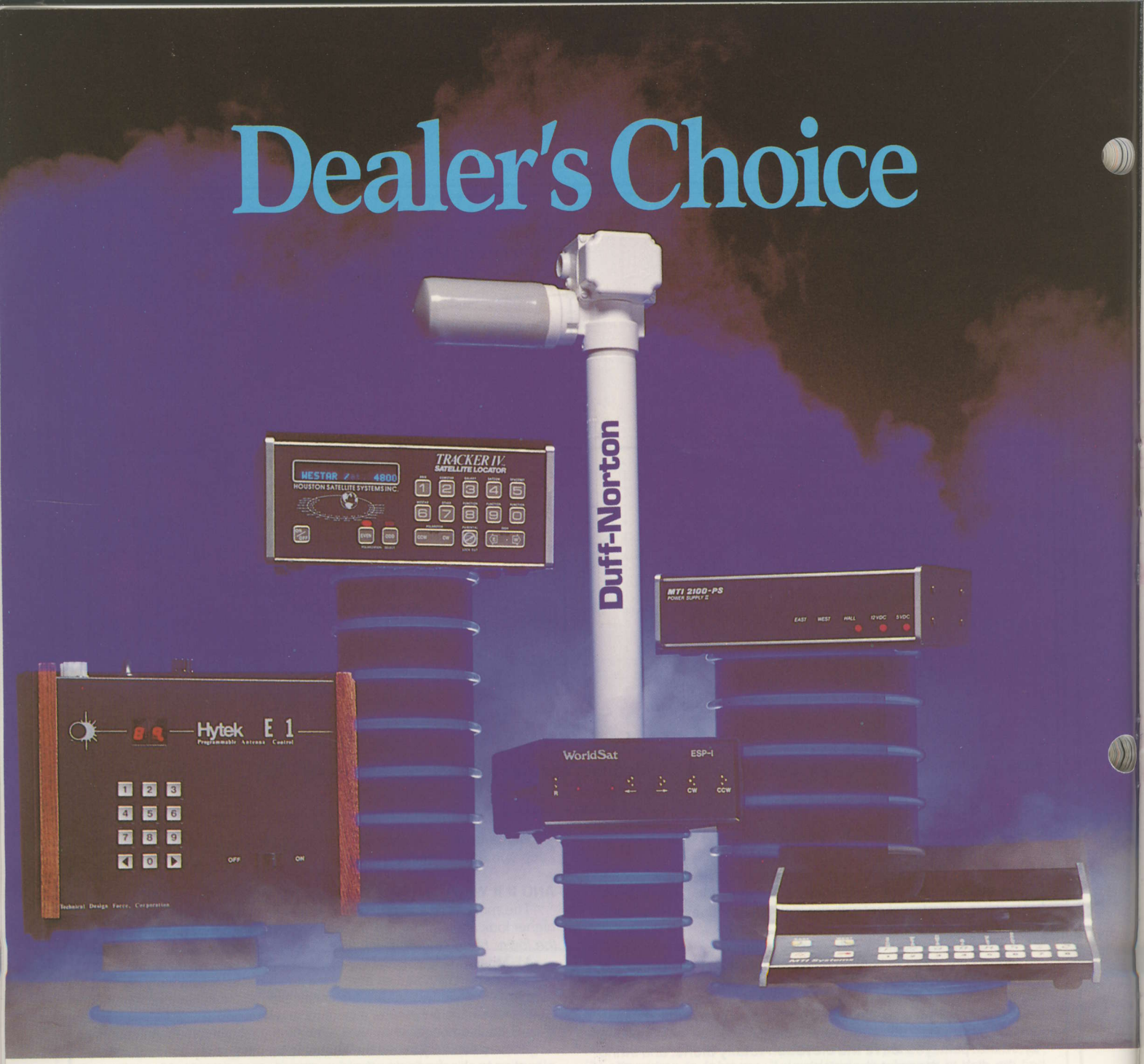
B) Perhaps the pipe is straight **but** the mounting hardware or welded-up section is not true. People make mounts and people cut and weld the pieces together. Some mounts are not adjustable and they depend on you being 'perfect' with your pipe. Maybe you are, but their welding was not perfect. The same 1 or 2 degree error that you can cause by getting your pipe into the concrete at an angle can also happen to the mount proper.

Once you are sure your mounting pipe is straight up and down, suspect that something in the mount itself is not 'plumb.'

C) The linear actuator is not linear. It is usually NOT a good idea to install an actuator so that at low look angles the actuator is

MOUNTS/ continues on page 46

Dealer's Choice



TRACKER IV, MTI, TDF-HYTEK, WorldSat... Your choice of the hottest controllers on the market today are now available from a single source...WorldSat—The Actuator Company.

Now you can pick the controller that best suits your needs. Each WorldSat kit comes complete with a controller, Duff-Norton® Actuator, and all the necessary mounting hardware.

Considered the premier actuator in the earth station antenna industry, Duff-Norton® Actuators include these features:

- Choice of 12VDC, 24VDC, 36VDC and 110VAC motors.
- Standard lengths from 3 to 65 inches.
- Lifting thrusts from 300 lbs. to 250 tons.
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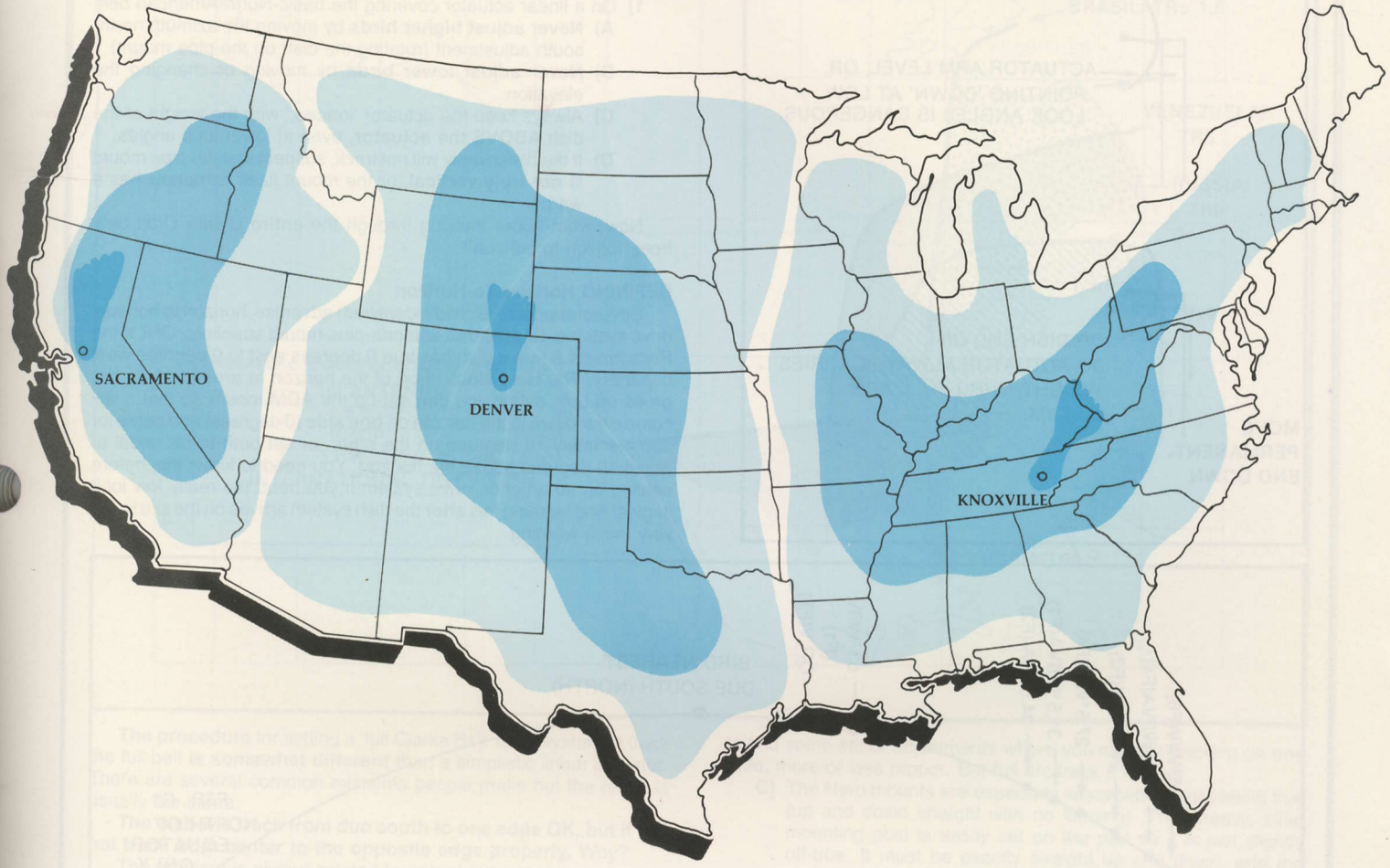

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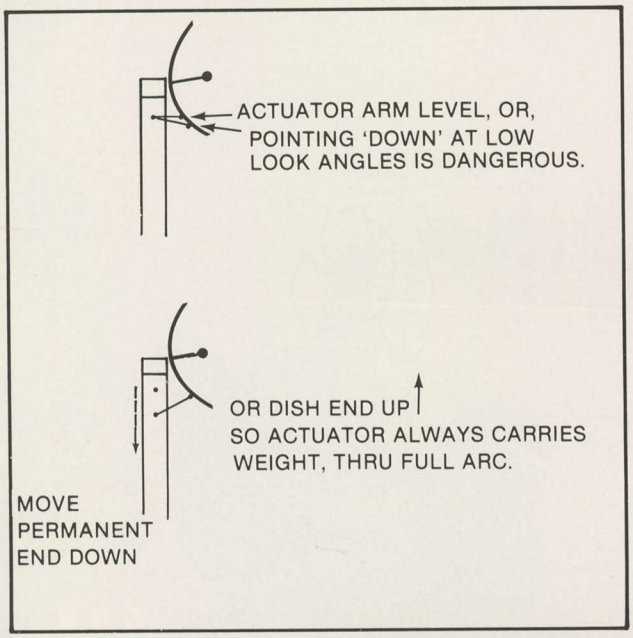
MOUNTS/ continued from page 43

below an imaginary line that is parallel to the earth; in other words, don't allow the actuator to 'tilt down' on the dish end at low look angles.

An actuator that tilts downward at low look angles is no longer holding the dish up; **now the dish is holding it up!** This places new types of stresses on the actuator; stresses that may not have been planned for in the design.



Remount the actuator by grabbing the dish closer to the center so you have the actuator pointing slightly upward even at low look angles; let the actuator 'push up' on the dish even at low look angles, which forces the actuator to support the dish at all times. The change over from the 'dish supporting the actuator' to the 'actuator supporting the dish' as the actuator arm comes upward and lifts the dish higher is a bad transition point for a dish and you can lose tracking here very easily. (You can also do damage to the actuator causing it to fail prematurely if you transition from 'load' to 'loading' frequently.)

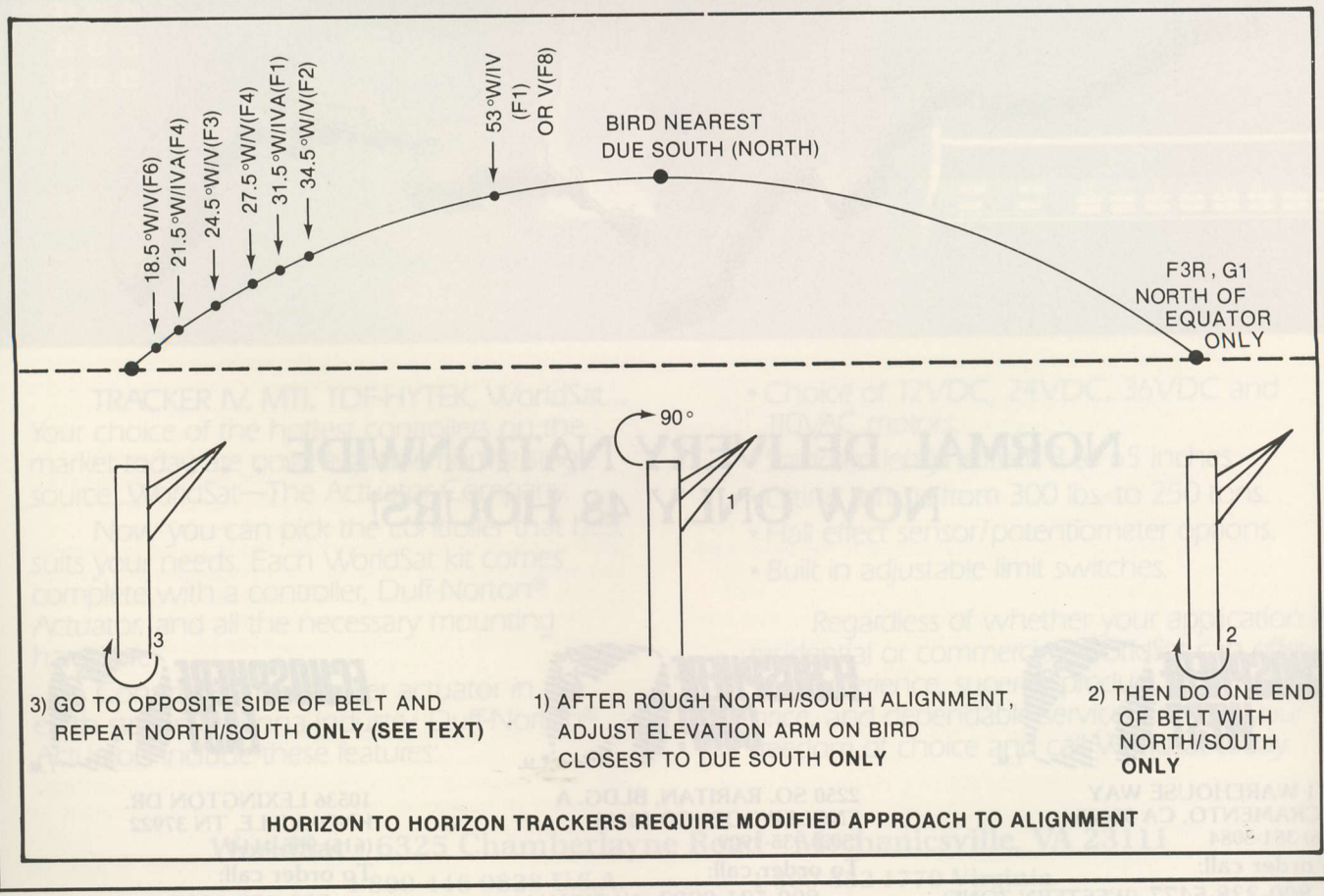
In summary:

1) On a linear actuator covering the basic North American belt;
   - **A)** **Never adjust higher birds** by moving the azimuth/north-south adjustment (rotating the dish on the pipe mount)
   - **B)** **Never adjust lower birds** by moving or changing the elevation.
   - **C)** Always keep the actuator 'loaded,' with the weight of the dish **ABOVE the actuator,** even at lower look angles;
   - **D)** If the dish simply will not track, suspect that the pipe mount is **not truly vertical,** or the mount itself somehow has a warp in it.

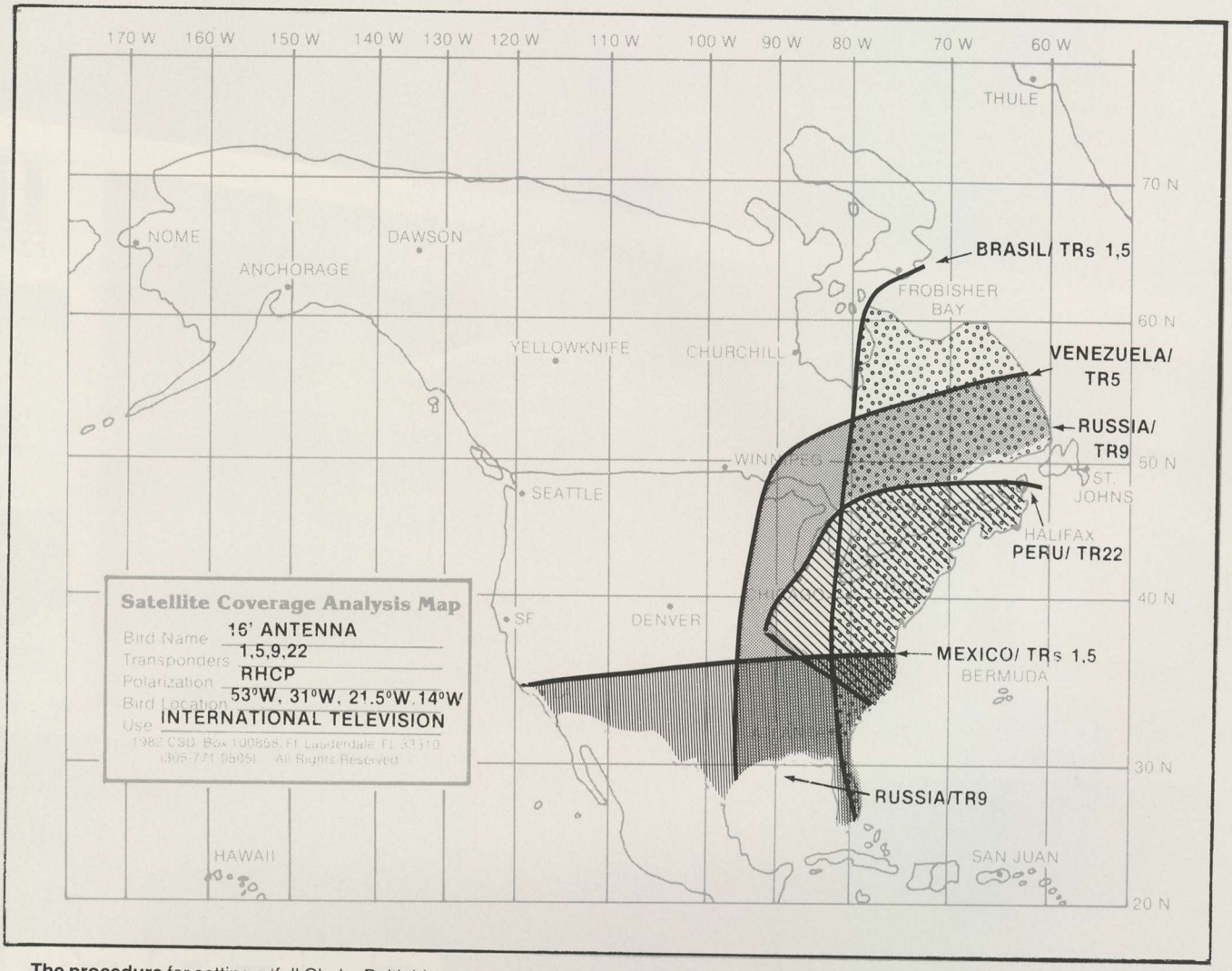
Now, what about tracking through the **entire** Clarke Orbit belt, from horizon to horizon?

DEFINING Horizon To Horizon

Several suppliers (already identified) advertise 'horizon to horizon' drive systems. Of the three antenna-plus-mount suppliers, ONLY the Paraclipse 4.8 meter dish has true 0 degrees east to 0 degrees west capability. The Hero stops short of the horizon at around 13/14 degrees on both sides; you **can** set-up the ADM mount so that it will come clear down to the horizon on **one side** (0 degrees) and settle for approximately 18 degrees on the other, or set both to be equal at about 10 degrees above the horizon. You need to know this before settling on an antenna drive system if you need the really low look angles! And learning this **after** the dish system arrives on the site is not very much warning.



HORIZON TO HORIZON TRACKERS REQUIRE MODIFIED APPROACH TO ALIGNMENT



The procedure for setting a 'full Clarke Belt' drive system to track the full belt **is somewhat different** than a simplistic linear actuator. There are several common mistakes people make but the result is usually the same:

The dish will track from due south to one edge OK, but it will not track from center to the opposite edge properly, Why?

The problem is always related to one of two areas:

A) Most common is that you don't have the north and south alignment properly north and south. It is possible, especially with the ADM three-legged mount, to be off so that **one side** is slightly higher (or lower) than the other back leg, and still have what **seems like** proper tracking on ONE SIDE of the belt. The other side tracks very poorly. If you have problems with an ADM mount, start by analyzing whether you are exactly level with the mount's elevated portion at the rear (north end, when north of the equator).

B) Slightly less common is that you have the declination offset in the general ballpark (say 3 degrees when it should be 5) but not right on the money. You can FORCE the elevation adjustment to compensate for this but when you do, you will lose (guaranteed!) your tracking on one of the two sides of the belt. The dish tracks fine on one side but has problems on the other. Go back and recheck your declination offset. This is especially true with the Hero mount.

You may have a combination problem; the declination is off some amount (say 1/2 degree from proper offset) while the mount is not really straight. If you have an ADM system, with independent adjustments for the front plus two rear leg supports, it will be possible to find some set of adjustments where you can get tracking on **one side,** more or less proper. But full arc track it will not.

C) The Hero mounts are especially susceptible to not being true (up and down straight with no leaning). Their heavy, pillar mounting post is easily set on the pad so it is just slightly off-true. It must be exactly straight up and down, **and** the mount must be squarely and firmly attached to the pillar or you **will have** tracking problems.

ALIGNMENT Procedure

Start off just as you would with a linear actuator; set the declination offset (carefully!), rough align the mount to north and south and make sure the mount is vertical. **Exactly vertical.** Now set the elevation to correspond to due south (or north) for your location (remember; your latitude plus a tad). Now swing the dish on the mount (**not the mount itself**) to find the first signal, closest to due south for you.

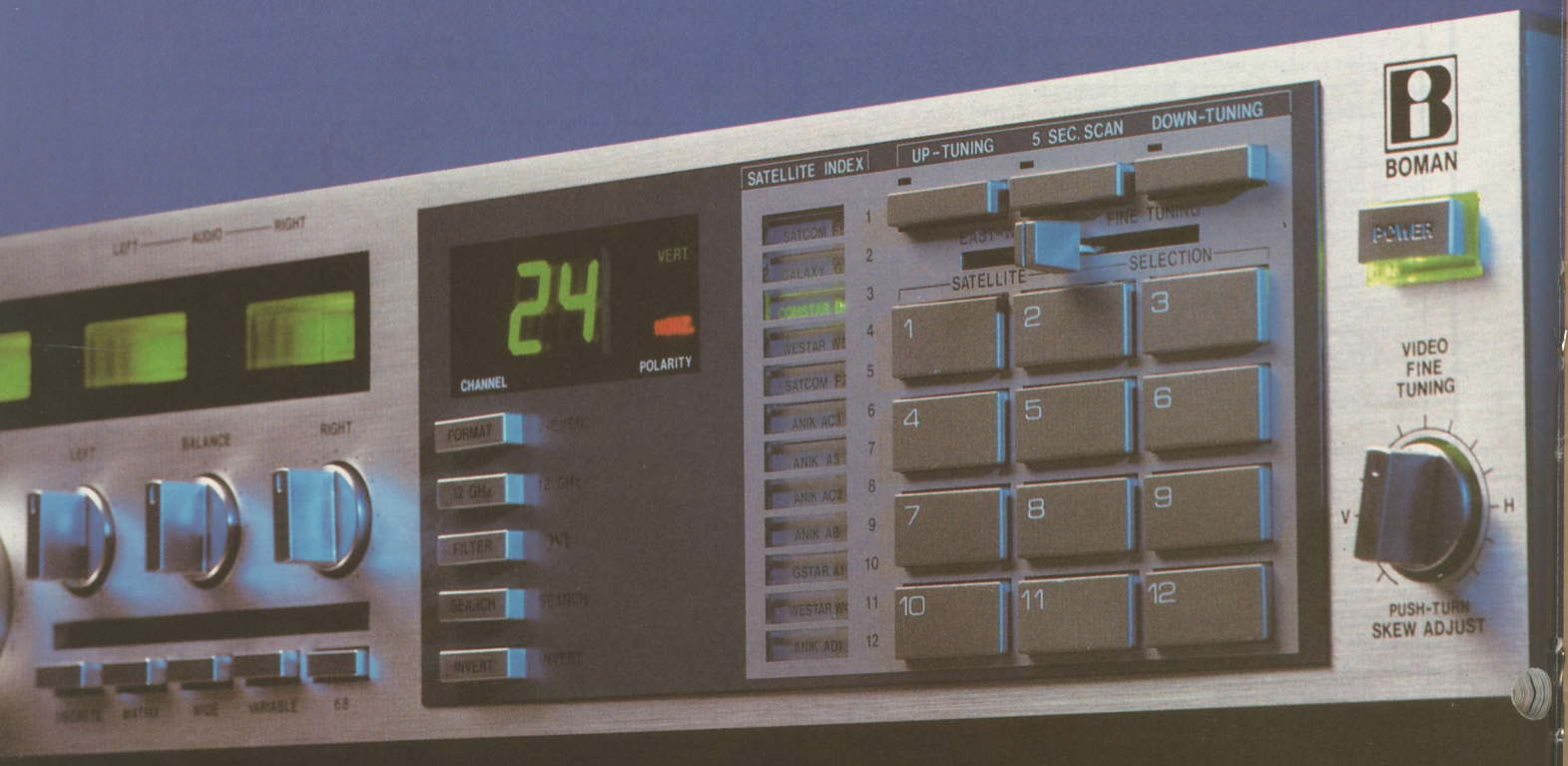
Now you head towards the western end of the belt since that is where most of the birds are located. The procedure here is the same as with the linear actuator drive; **adjust it in by rotating the dish mount itself** (ie. perfecting north-south alignment).

At this point you head clear to the **opposite** (eastern) sky; don't even stop at a higher look bird. A word or two about the birds to the east.

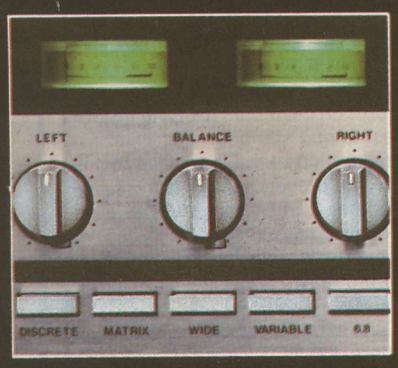
1) The Intelsat at **53 west** (the one in use for Mexico) is first of all moving in a slow figure 8 pattern. It is NOT always exactly over the equator, although it is close. **It would be a mistake to align**

MOUNTS/ continues on page 50

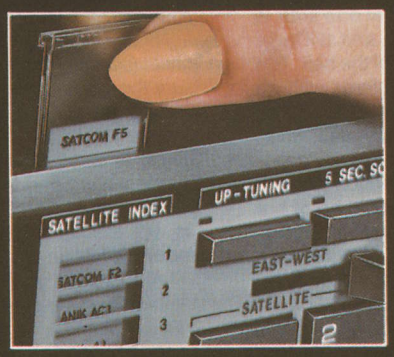
ALL IN ONE



STEREO SATELLITE RECEIVER



The *AUDIO GROUP* provides superior *Stereo* reproduction to ensure viewer satisfaction.



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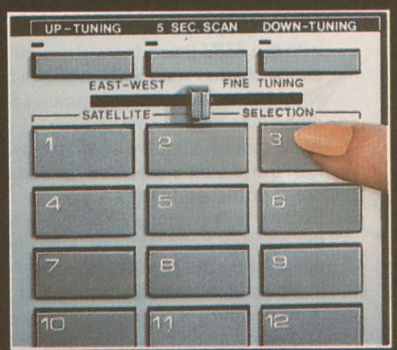

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MOUNTS/ continued from page 47

to it, however, since it could be several tenths of a degree north (or south) of the equator. Skip over it. It is ALSO not far enough east to do you much good unless you are in the Rockies or west (where it will likely be the last bird you will see to the east).

2) The Russian bird, **at 14 west,** is also not a good alignment bird because it also is moving in a figure 8 pattern; north and south of the equator at different times of the day. You'll notice this figure 8 flight pattern, even on a 10 footer (!) with better signals later in the day. And with bigger antennas, it may all but disappear from view around mid-day. That's normal, and the Russian way of doing things (all of **their terminals** tweak on the elevation, automatically, to follow it; they think that is cheaper than expending thruster fuel to keep it dead over the equator.)
3) The birds for eastern alignment will be Intelsat IVA/F1 at **31 west** (Venezuela, strong, is here) and Intelsat IVA/F4 at **21.5** west (Brazil is here). They maintain their station keeping quite closely. Larger antennas (16 feet and up) will find Intelsat V/F3 at 24.5 west and V/F6 at 18.5 west also excellent for stability although you may be better off using an SCPC transponder rather than the weaker Global Beam patterns with video on them on TR24.

The object is to be dead-on when you hit your reference eastern bird, just as you were with your far western bird. And if you are not? Touch up your north-south rotational adjustment (dish on mount) just slightly.

The temptation is always there to tweak it in with the elevation control, and then move the dish on the mount (with the motor drive) just a tad. **DON'T do it.** That's a good way to get even further off!

Work back and forth using your north-south rotational alignment ONLY between the eastern reference bird and your furthest west reference bird. Don't stop until you have them dead on or at least the same. When you have this balance completed, THEN return to a high look angle bird and see if your elevation adjustment needs tweaking. If it does, go ahead and make the adjustment and then return to your western side and re-check. You will probably find that even having made a (modest) change in the elevation, your western edge is still on the money.

Here is how you check yourself.

1) Set on the western reference bird and note where your elevation adjustment is set.
2) Now, **turn the elevation adjustment** first a half turn **one way,** and then back to 'neutral,' **and then** a half turn **the other way.** Did the signal **go down** as you went away from neutral **in both directions?** Good. If it did not, but came up as you rotated the elevation up, or down, that tells you the north-south is STILL not true. If you are doing this on the western reference, and the signal came UP when you dropped the elevation down (closer to the ground), that tells you the dish is still pointing west of true south (ie. north and south is actually biased towards NW and SE). If the signal came up when you increased the elevation, that tells you the dish is biased towards east of true south. You correct by going the opposite way with north/south; rotate the full dish to the west to correct for an east bias and to the east for a west bias. **Remember** — return the dish to the proper elevation setting (where you started) **before re-biasing** the north and south. NEVER try to correct a low look angle problem by cranking on the elevation! (And, NEVER try to correct for a high look angle problem by cranking on the north-south alignment.)

The path here is to get the dish properly tracking **at the two extremes;** furthest east (where you have a bird that is known to be stationary over the equator) and furthest west. **Then and only then** make your final tweaking on the high look angle reference bird.

The last adjustment to make is to always check out the eastern and western ends one final time. And, after every adjustment of either elevation OR north-south polar, **touch up the dish motor drive control** because any adjustment you make to the dish is going to move the boresight slightly one way or the other. (If you make an adjustment, and check it by moving the dish motor drive and discover that you **cannot re-peak the signal** with the dish motor drive, that tells

you are moving the dish all right but it is moving along **parallel to** the belt, **not within** the belt.)

PROPER Test Equipment Important

You cannot properly align a horizon to horizon system with your eyeball, nor with the 'signal level meter' on a receiver. Even the AVCOM 3R/ International meters are **not adequate** for this exercise (although they are the most responsive meters in use today, built-into-receivers). We refer you to the **May 1984** issue of **CSD** for an intelligent discussion of outboard metering systems and how you go about detecting very minute changes in signal levels.

TRANSPONDER WATCH

RECENT REPORTS OF ACTIVITY ON DOMESTIC / INTERNATIONAL SATELLITES

Send your reports to CSD Transponder Watch, P.O. Box 100858, Ft. Lauderdale, FL 33310. For late news, call (305) 771-0505.

AVITEL, the Great Falls (Montana) distributor has filed for Chapter 11 (financial reorganization). AVITEL has 100 dealers in 12 states, but **may** opt to concentrate on retail-**only** selling under the reorganization.

ARABSAT, the new Arab national satellite, will not have its programming scrambled. But the control data signals will be. Officials have revealed the signals sent to the satellite(s) to command their flight pattern(s) will be encrypted to prevent unauthorized uplinkers from taking over the bird (!).

LATEST channel line up for Intelsat at 1 west; **ABC** London on TR1 and **CBS**-L (London) on TR2; both half transponder about 16 dBw. **Radio Television Portugal** on TR19 (full transponder) at about 19 dBw; **Brightstar** out of London on TR23 (full transponder) at the same level; **AFRTS** on TR 24 (full transponder) with about 21 dBw and very hot (widely deviated) audio.

USIA tests of video teleconferencing via Ku band Intelsat birds successful, using dishes in 8 foot region. Video signals are sent in digital form, a form of encryption, and only parts of the scene that change from field to field are 'updated.' Effect is full motion, but at less than full motion bandwidth.

FULL EFFORT to get TVRO Viewing Rights acts tacked onto other legislation down to wire. Most conceded there was little hope of passage of S.2437 bill or H.R. 5176 bill this session, if they stood alone. However, by getting one or both bills added to another piece of legislation headed for passage, there was hope one or both might squeak through in closing days of session. A clever move, if it works.

USCI admits it cannot (or did not) raise the quick-$40M it needed to stay alive in the early-bird DBS market. But they are not giving up their efforts to raise more money to keep USCI afloat. Reports indicate that RCA Service Company crews can install (typically) 1.3 of the 2 or 4 foot dish terminals per working day. They obviously need to attend a 4 GHz industry trade show to see how it is done. Arrangement with RCA runs through November.

LATEST HBO rumor has them thinking about building **12 GHz** satellite they would own, operate and program to send DBS to individual homes and SMATV. Does this mean their 4 GHz plan is 'dead'? Tune in next month to see.

REVISED launch schedules, following February Pam-D failures, shape up as follows for early term: SBS-D (12 GHz) and TelStar 3C (second of the current 4 GHz birds) scheduled for August 29th; Telesat Canada's D2 bird (24 channel C band, both poles) November 2nd.

LOSS of Intelsat V/F9 final straw for those who offer insurance to satellite launchers. Bird failed to achieve orbit when second stage on rocket quit. Intelsat not hurt by loss as they had excess satellite and transponder capacity (F9 probably was destined for Pacific basin).

USCI concerned that Chicago's zoning program to eliminate TVROs may hurt its own marketing plans; has asked FCC to do the same thing SPACE asked of the FCC last December. Namely, preempt local zoning ordinances which seek to limit or eliminate TVRO antennas. USCI has a 12 GHz interest; SPACE has a 4 GHz interest in the same problem.

JAPAN's NEC, perhaps tired of seeing Japanese satellites quit prematurely because of high power TWTA tube failures, has completed design and testing on a 230 watt (12 GHz) power tube.

PAY some attention to the space around 41 west. That's where the sole operational TDRS satellite is positioned and recent tests indicate the bird is radiating some 4 GHz 'test' signals (non video to date). The 12 C band transponders are under the control of a private corporation (Systematics General Corp.) and SGC recently asked FCC for permission to use those 12 C band transponders for linking eastern USA with western Europe. SGC has also asked FCC for permission to use the yet-to-be-launched TRDS birds for C band linking between Asia and western USA. TDRS at 41 west is in 'interim' spot, may be moved after additional TDRS birds are operating. Next launch now scheduled for February 1985 (to 171 west) with follow up launch scheduled for July 1985.

HBO claims they will **terminate** F3R feeds on TR20 (Cinemax east) and TR24 (HBO east) **October 1st,** in favor of exclusive feeds on G1 (TR19 and 23 respectively). Western feeds of HBO will remain on F3R, TRs 23 and 13, for now.

INTELSAT apparently sees handwriting in the sky; new policy will offer 100 (!) total transponders on six of the V series and two of the V-A series satellites to **cable television** programmers.

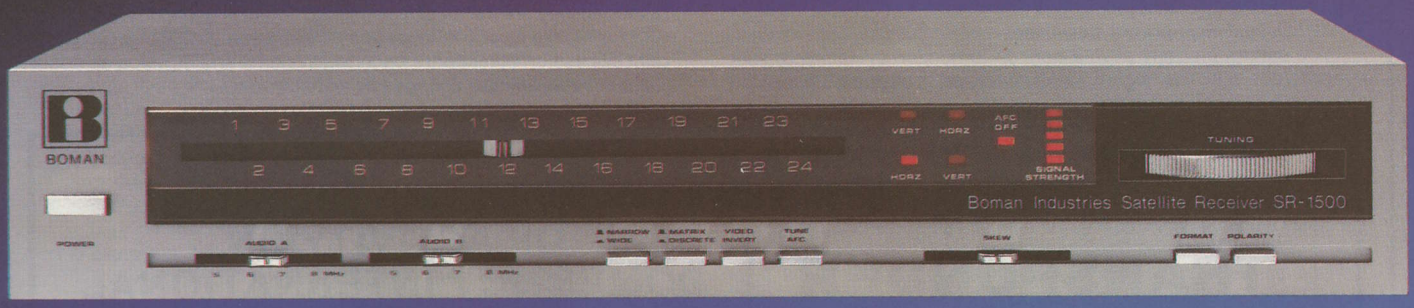
CBS has decided it will **not be** a part of DBS afterall. That has direct impact on planned COMSAT DBS program since CBS was hoped-for co-partner in venture. There is NOW **talk** that STC, COMSAT DBS program, could close down before it begins.

UPLINK operators have gotten a reprieve; they were supposed to have only uplink antennas capable of protecting two degree spaced birds in operation by July 1st. FCC has backed down, will establish new deadline when it figures out how long it **really** will take for uplinkers to comply. Many existing uplink antennas in 10/11 meter range cannot make the grade and replacement is required.

STATE Department upset that after it talked with approximately 60 nations concerning 'coordinating approvals' for use of US domestic satellite services (including video) offshore, only nine nations have followed through with their required paperwork. To date, only Antigua, Cayman Islands, Canada, Dominican Republic, Bahamas, Netherland Antilles, Panama and (British) Virgin Islands have met all of the US qualifications. Under US/FCC plan, first an applicant must apply to FCC; then FCC must get assurances that service can be delivered. Next the nation involved must approve service and **also agree** to enforce US communications law if the plan is approved. That's where it falls apart; not all of the nations want to enforce US laws.

KTVT uplink signal on F4, TR21, may get better by September; they are currently using S/A 5 meter dish and will upgrade to 9.2 meter. Service on F4 has been erratic during July with some outages and signal is down 3 dB typically from WPIX service on TR19.

Affordable Stereo



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SPACENET coverage from new 8.5 watt (vertical numbered, horizontally polarized) transponders disappointing. Service contours behind those predicted. No **entertainment** services have signed up here yet; primarily to be used for various religious groups planning church type nets.

EFFORTS to force breakup of monopoly COMSAT continue with House sub-committee hearings recently completed. COMSAT characterized itself as "an extremely small company . . ." while opposition, led by M/A-COM and others pointed at what they classified as 'excessive revenues and earnings' totaling more than $50M over four year period. Jury is still out.

RCA's F1 bird is gone but not forgotten. Satellite was ejected into far-out orbit in mid-June so it would not become part of the Clarke Orbit belt 'junk' that is rapidly collecting. When it was boosted out of orbit, it still had 22 operating transponders according to RCA. Control fuel was exhausted, however.

PanAmSat, proposed international C and Ku band service for Latin America, plus Caribbean, is starting to collect flak. Intelsat has remained quiet to date but others are saying PanAmSat cannot be approved by FCC.

SERIOUS questions concerning long-term growth rate for Intelsat has surfaced at FCC. COMSAT, U.S. participant in Intelsat, had routinely sought FCC approval for participation in next (Intelsat VI/6) series of satellites. FCC study suggested that while 'some' 6 series birds might be required by 1990 or so, the proposed number requested seems like overkill.

CORONET, newly approved 12 GHz DBS bird to be licensed and operated from Luxembourg, has confirmed that it will not be a 'toy' for American firms such as HBO. Amidst European fears that Coronet would become American vehicle to 'slip' US premium and sports and news services into Europe, firm has released statement that while HBO does indirectly control 5% of firm, no American programming firms will be allowed to use any of the bird's planned 16 channels.

COVERAGE of future Space Shuttle flights should be found on TR13 of Galaxy 2; with **potential coverage** into extreme western edges of Europe as well as significant portions of northwest Africa.

SOVIETS 'telegraphed' their intentions to pull out of Los Angeles Olympics in advance by failing to launch new Gorizont birds for Atlantic and Indian ocean regions. Soviets have always preceded major world events with launch of new Gorizont birds to insure widespread coverage of Soviet bloc nations' participation. This time no new Gorizont birds foretold of no Soviet bloc participation in Olympics.

DIRECT interconnect to SBS satellite has been accomplished for a rural Alabama telephone cooperative with approximately 11,000 lines. Brindlee Mountain Telephone now has its own space station switchboard, via SBS; program is considered test for other independent telcos in USA.

DBS participants have walked away from FCC sponsored and coordinated meetings after failing to agree even **how** to establish DBS standards for new 12 GHz industry. Efforts to define terms, agree on channels, channel-width, polarization and other basics failed. No new attempts are scheduled; each of the satellite planners will now go their separate ways.

CNN may be first Turner service into Europe, via leased transponder on Intelsat (V series) bird. Turner hopes to work deal with European Broadcast Union (EBU) to send all CNN per day to Europe for local member use as they see fit (i.e. using portions for their own schedules), in return for getting Turner access to national TV network's new coverage coming out of Europe on return flight on Intelsat.

CBS may abandon T301 (presently on TR2) in favor of new T302 bird after it launches late this month. No firm decision yet but talks are going on. ABC is presently on T301 also.

SCPC ACTIVITY REPORTS

'Letters'

Conducted By Marshall Foiles/VP5M

Acknowledgement

Mail to your column conductor is much appreciated and the considerable amount of data 'shared' by those who are interested in SCPC reception, or already enjoying it, is excellent 'fodder' for the ongoing growth of this phase of satellite services.

Bill Johnson (Glenpool, Oklahoma) is confused, He writes:

"The method of listening to 'subcarriers' by connecting a 'communications type receiver to the 'unfiltered video output' of a satellite receiver (baseband output) is not new to me. I've known this to be useful up to 7 or 8 MHz; yet, on pages 65-66 **(May CSD)** you mention 36 MHz of useful bandwidth. Now I am more than a little confused.

"What is S.C.P.C.?

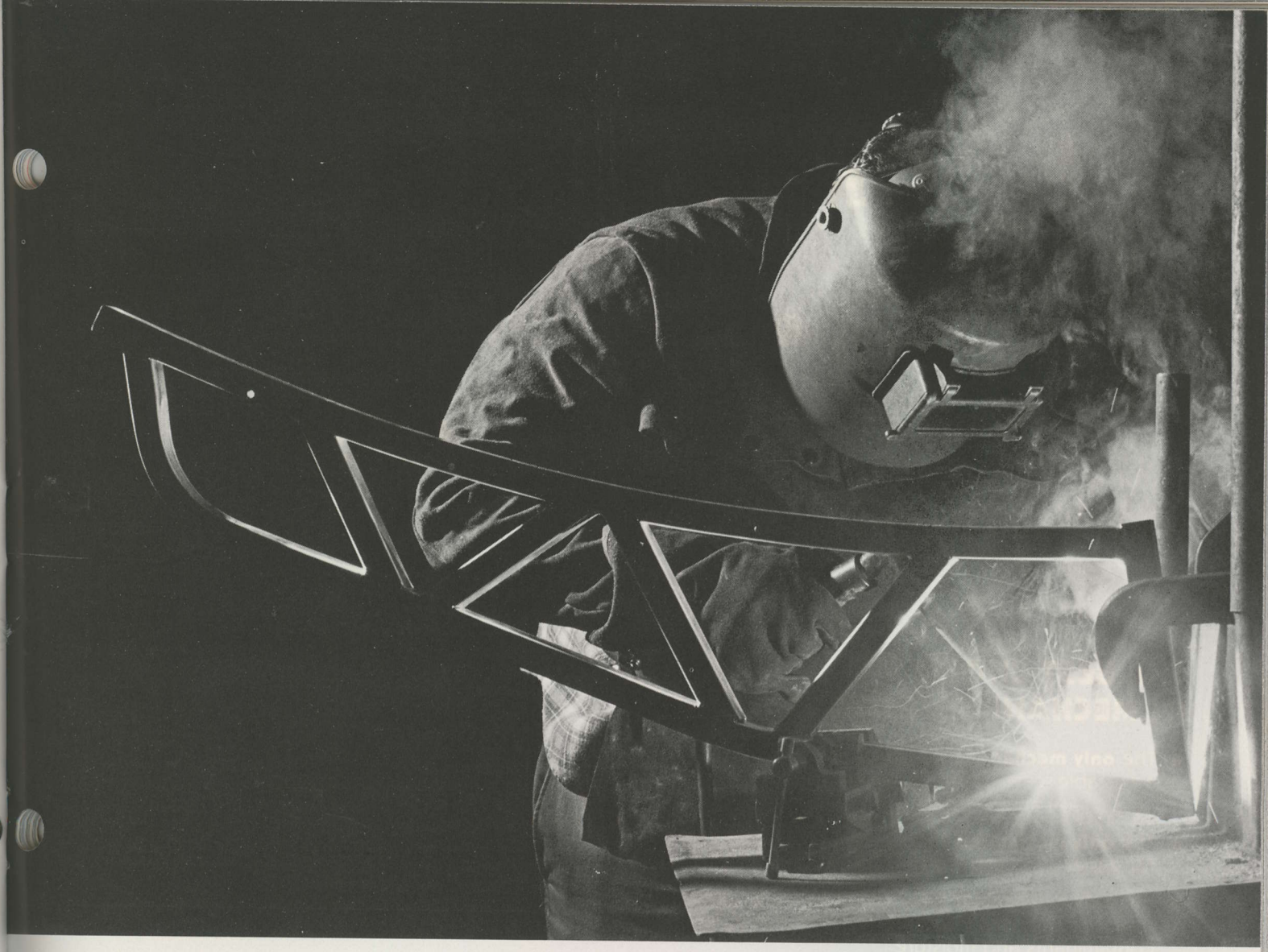
"Is it not a carrier by itself, not modulated onto the main carrier, and consequently not available at the output of the receiver's discriminator? I know that this type of SCPC is in use today, but I am unsure whether this is the type of transmission the column is referring to. Please explain."

That's it. A sub-carrier might better be called an **'attached carrier'** because it cannot stand by itself. The only pure carrier in a satellite TVRO system is the video carrier; it is generated by itself, modulated with the video information, and it contains all of the elements required to get from 'here' (the uplink site) to 'there' (your downlink site). Even the program audio (the sound that is the audio for the picture) is sent on a 'sub-carrier' (or attached-carrier). A sub-carrier cannot travel from 'here' to 'there' on its own. It is introduced into the uplink part of the system by attaching it to the video carrier. If you take away the video carrier, you lose the sub-carrier as well. Multiple sub-carriers, the type you can tune in with a Drake SA-24, Arunta SSP-318 and so on, or with a TVRO receiver with sub-carrier tuning built-in, are all **'attached carriers.'** Take away the video, and they all go away; even if their audio material seems to be totally unrelated to the 'content' of the picture carrier. Program wise they are separate; technically, they are impossible without the video carrier.

When we speak of a '36 MHz bandwidth,' we are talking about the full, **usable,** bandwidth at the RF carrier frequency of the up or down link. Transponder 1, for example, extends from (typically) 3702 to 3738 MHz Less accurate charts show it to be 3700 to 3720 or 3.7 to 3.72 GHz. That 36 MHz bandwidth persists or stays with us from the uplink transmitter, through the satellite, to your downconverter and through your receiver IF. A 70 MHz IF? It has a 70 MHz 'center channel frequency' but it actually is quite wide; from 52 MHz to 88 MHz if it is capable of passing and processing the full channel or transponder width.

This '70 MHz signal' is processed through the 'IF' stages to the demodulator (same as discriminator). There it is turned from a modulated carrier wave signal that is 36 MHz wide **to a** 'baseband' signal that is, at the very-very most, around 10.7 MHz wide. That 10.7 MHz wide 'signal' can be thought of as the 'final' or 'last conversion stage' in the receiver. The information that falls between 0 MHz and 10.7 MHz, coming out of the discriminator/demodulator, is where we find our video (picture) information. Attach that 0 to 10.7 MHz wide signal to a video picture tube (i.e. monitor) and you will have television pictures displayed!

So what 'was' 36 MHz wide is now 'no-more-than-10.7 MHz' wide, **after the discriminator;** a form of 'bandwidth compression' or 'frequency crunching.' However, the actual video picture information will occupy no more than 4.2 to 4.5 MHz **(from 0 MHz to 4.2/4.5 MHz)** of that as-wide-as 10.7 MHz signal. That leaves a considerable amount of frequency space to tack on 'attached signals.' The sub-carriers attach in this region, usually no lower than 5.0 MHz and no higher than 8.1 MHz. (In the **real world,** the original transponder is usually not fully



IT'S WHAT YOU DON'T SEE THAT MAKES THE DIFFERENCE

The Superior TM high performance satellite antenna manufactured by U.P. Superior Satellite Dish Mfg., is lightweight yet strong with proven low wind resistance and stability in the field. A scientifically designed aluminum mesh configuration makes this possible! Each manufacturing process at U.P. Superior Satellite Dish Mfg. is carefully detailed along with a strict quality control policy. This allows the five and one-half, eight, ten, twelve, sixteen and twenty-five foot Superior TM antenna models to be second to none for reliability and consistancy in exceptional performance! At U.P. Superior Satellite Dish Mfg. *it's what you don't see that makes the difference.*

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NEW FROM M/A-COM
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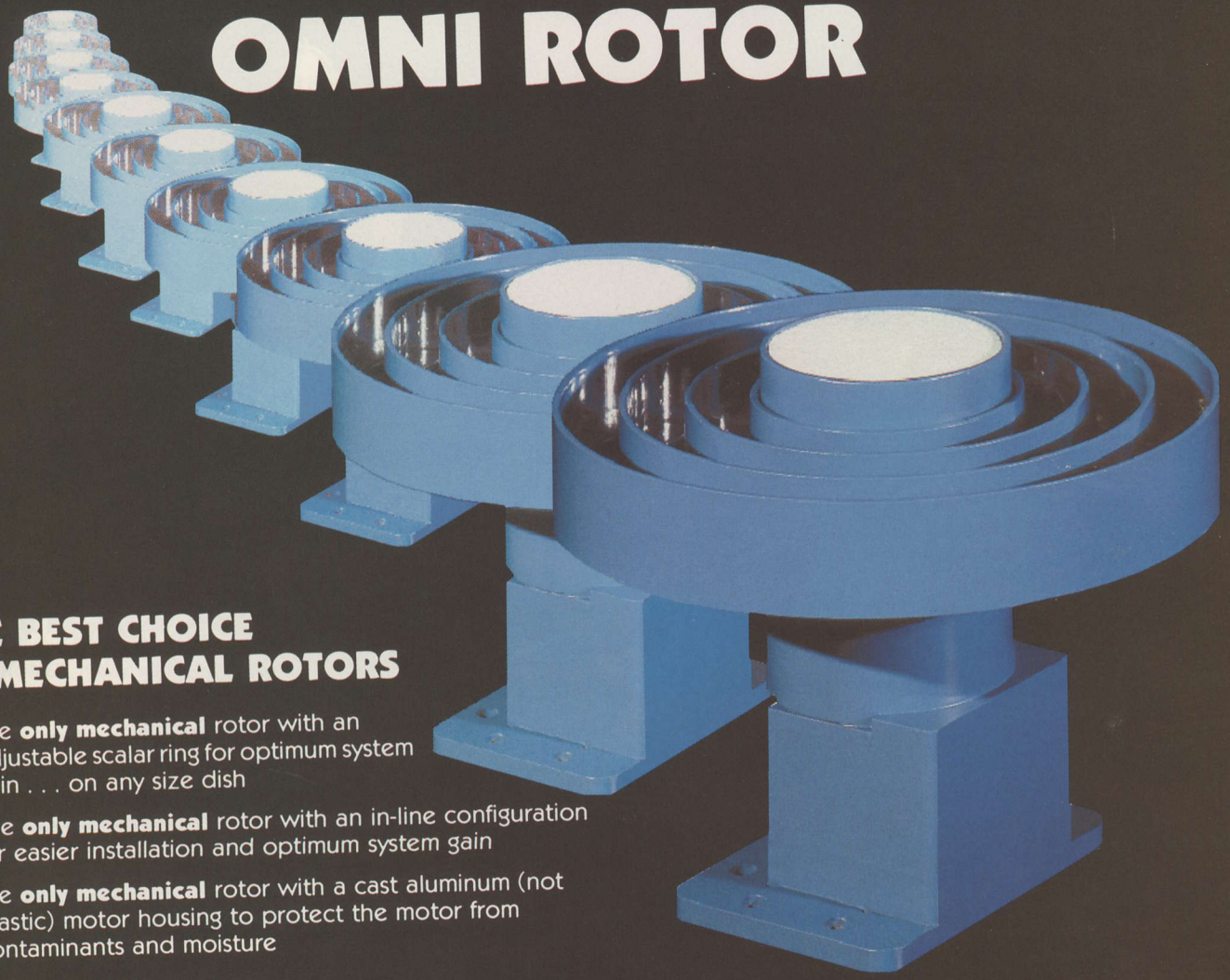

THE BEST CHOICE IN MECHANICAL ROTORS

- The **only mechanical** rotor with an adjustable scalar ring for optimum system gain . . . on any size dish
- The **only mechanical** rotor with an in-line configuration for easier installation and optimum system gain
- the **only mechanical** rotor with a cast aluminum (not plastic) motor housing to protect the motor from contaminants and moisture

The Omni Rotor also features:

- All aluminum scalar and housing for mechanical rigidity
- 0-180° rotation with fine adjustment
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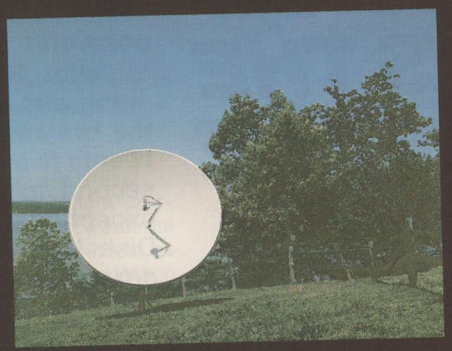
Until today, installers who favored rotor-controlled feeds had only one choice. Trouble was, there was plenty of room for improvement. Now, here's the better alternative: M/A-COM's Omni Rotor.

Omni Rotor is the only mechanical rotor with an adjustable scalar ring, for optimum system gain. The only rotor with an all cast motor housing, to protect your motor from freezeup, contaminants and moisture. And it's the only mechanical rotor designed in-line, to make installation fast, easy and accurate.

Best of all, Omni Rotor is manufactured by M/A-COM Omni Spectra, the most respected name in the Home TVRO industry. Other M/A-COM state-of-the-art Home TVRO products include the Omni Polarizer (with solid state control), 8' and 10' Prodelin reflectors, polar mount, receiver, LNA, LNB and cable accessories.



Take a look at the features of the Omni Rotor, and its price, and you'll agree: There's only one choice in mechanical rotors: Omni Rotor.

Check the adjoining strip for the authorized M/A-COM distributor in your area. Or contact:
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used to its full 36 MHz width — 30 MHz is more normal — so if we **lose part of** the overall 'width' we will **also lose part of** the 0-10.7 MHz 'width' as well.)

When you tune in a transponder that does **not have** a TV signal on it, they may be using it for other forms of communication (TV being but one 'form'). One of these forms is called SCPC (single **channel per** carrier, **or,** single **carrier per** channel, depending upon which 'school' you went to!). SCPC can be tuned in, as you suggest, by connecting the baseband or (normally) video output from your TVRO receiver to a communications receiver that tunes the frequency range from 0 to say 8 MHz. If there is **no video** there, and **there is** SCPC use of that transponder, you will tune in these SCPC signals on the communications receiver.

We call these **SSB/SCPC** because they are transmitted using a modulation format known as single sideband (SSB for short). There is another type of SCPC as well; using a frequency modulation rather than a single sideband modulation format. All of the services we have written about, to date, here are **FM/SCPC** signals. Because they are FM, and not SSB, to tune them in requires an FM receiver that is capable of tuning **NOT** the 0 to 8 MHz frequency range but rather **the original** 70 MHz receiver range prior-to the discriminator/demodulator.

Why is this?

The demodulator/discriminator is a **wide**band device. These are '**narrow** band' FM carriers. They are not 36 MHz wide (or 30 MHz wide) **each;** they are but a tiny fraction of that wide (typically 60 to 100 **kilo**hertz or kHz). If a wideband discriminator demodulates them, they are lost; gone. If a single transponder has two or 200 of them, they all get demodulated as a 'lump,' all together. You get no 'audio' or intelligence out of that; only noise. Thus the requirement for the special FM demodulator receivers that tune through the 50-90 MHz (IF) region, to catch these signals **while they are still 'RF carriers'** and before they get messed up in the wideband demodulator in our TVRO receiver.

Is that clearer, now, Bill?

WHAT IT TAKES To Tune It In:

1) **Video:** Wideband receiver, capable of 14 to 36 MHz bandwidth.
2) **SSB/SCPC:** Wideband downconverter going to a wideband demodulator (30 MHz or better with an 8 MHz or better baseband output bandwidth) in turn going to a selectable sideband (SSB) upper/lower sideband communications receiver tuning 0 (.1) MHz to 8 MHz (+).
3) **FM/SCPC:** Wideband downconverter with a 70 MHz (centered) IF connected to a 60/100 kHz bandwidth FM audio receiver that can be tuned **between** 50 and 90 MHz.
4) **Sub-Carriers:** Wideband (video) receiver capable of processing video in an IF from 14 to 46 MHz wide, a wideband video discriminator/demodulator capable of passing 0 to 8.0 MHz, feeding a 100/200/400/800 kHz wide FM detector that tunes from 5.0 to 8.1 MHz.

Edgar Thomas (Canton, Ohio) recovers FM/SCPC signals much in the same way we outlined in this column for June 1984. He uses a 'drug-store-bought' AM/FM/TV-audio receiver. He selected one with an audio 'tone control' because he says it helps with the pre-emphasis which most of the FM/SCPC signals have built into their uplink signal (pre-emphasis accentuates the highs in the audio transmission as a means of spreading out the signal's power-punch). He connects the 70 MHz downconverter of his TVRO to the antenna input on his 'drug-store-receiver' (TV audio) and he tunes his **TV audio receiver** between channels 2 and 6, just as he outlined last month. He happens to have a Scientific-Atlanta model 6600 (series) TVRO receiver, which has a 70 MHz 'test port' right on the front panel. He writes "(as you tune in an FM/SCPC signal) **either side of dead center for the signal** you will hear a 'swish/swish' sound. I am guessing it is the 'frequency dither' which they attach to the signal at the uplink (**that's it Edgar,** but only about 25% of the FM/SCPC signals bother to 'dither' — **Marshall**). I place the S/A receiver into the manual gain mode (MGC) and adjust the MGC control for best reception." Then he asks, "Does anyone have an inexpensive way to recover digital audio from the F1R transponders???". We'll re-ask it, Edgar. Over on F1R, most of the

major radio networks are switching fast to 'digital audio transmission systems.' We've seen no circuits around that allow you to recover these digital audio signals **inexpensively.** Surely with the digital stereo stuff starting to come out of the Far East, somebody has this one figured out. **Anybody listening?**

Webb Linzmayer (Morris Plains, N.J.) is primarily interested in radio teletype services found on satellite (and HF) and he sends along an interesting pamphlet of data describing the Frederick model 1202RB teletype demodulator. We plan to take a close look at the Frederick unit later this year as we sort out first our audio FM/SCPC channels and then take a look at the radio teletype data now found on several channels.

Webb is concerned about some of the terminology **we have adopted** for this column, and his points are well taken. He writes "(recently) **the meaning of demodulator** has been getting enhanced and this is causing some confusion amongst newcomers to the various fields where that term is used. An RTTY (radio teletype for **our own** newcomers!) demodulator, strictly speaking, is a piece of equipment (or a sub-system) which converts 'tones' to a corresponding voltage or current waveform. The printer, computer, dedicated CPU, video generation circuits (and so on) that follow the demodulator should be differentiated from the demodulator itself . . .".

Strictly speaking, Webb is correct. Unfortunately, what we have here are two different communication schools of discipline which until now have stayed out of each other's way. What 'demodulator' meant to a person interested in radio teletype and what demodulator meant to a person interested in satellite television (or radio) were not the same; but that was 'OK' because these two people didn't talk to one another anyhow.

Now we have them talking, and each is confused when the other uses the magic 'word.'

Since this is primarily a TVRO publication, and we have 'invited' the RTTY guys 'in' for a 'visit,' we'll respect 'home ground' terminology. You guys coming in from the RTTY world will just have to pretend you are tourists and adapt to our language styles. It's no different than going to Europe and asking where the bathroom is. You might find out! And all the time you were really looking for a 'water closet' and you didn't know it!

This Month's Listings

The following listings show you where you can find the (typically) 60 kHz wide **FM/SCPC** services using either a dedicated receiver such as the **Hero SCPC-66** or a TV band audio receiver (see this column for June 1984). Not all services will be found operating 24 hours per day and many maintain irregular hours within the 24 hour day part. Our designations are as follows:

1) **N** = Known to be less than fulltime
2) **MN** = May not be transmitting fulltime
3) **S** = Scheduled times (given)
4) **SE** = Special events, such as baseball game coverage (only)
5) **22.3** = Example only, shows tuning system indication for Hero SCPC-66 receiver. A complete table of frequency translation appeared on **page 80** for **CSD/June 1984** and you are referred there if the numbering system confuses you.

Most of the FM SCPC transponders have as many 'unmodulated' (i.e. the receiver goes 'quiet' as if you are tuning in a signal [background noise disappears], but, you hear no audio) carriers as they do 'modulated' (program or other audio) carriers present. An unmodulated carrier may be briefly quiet (minutes to hours) or it may be unmodulated fulltime. Our listings are for those carriers that are modulated at least part of the time. Some of the radio news services, such as Mutual, only transmit news for a portion of each hour (such as 00, 15, 30, and 45 after each hour) and the balance of the time the carrier is **(1)** unmodulated or **(2)** it ticks or 'beeps' at you at precise one-second intervals.

Unusual:

Everyone is aware that WGN's sub-carriers on TR3 of F3R are among the most 'prolific' in the FM sub-carrier world; virtually every form of music and special audio program you can imagine is there as you tune from 5.0 to 8.1 MHz. **But did you know** that in

addition to all of these sub-carriers, plus the regular WGN video signal (carrier), there is **also** an **FM/SCPC** service **on TR3** of F3R?

True. The FM/SCPC signal is located at the very bottom end of TR3, down 'below' the video carrier portion. WGN is restricted in its video modulation waveform so that it does not go all the way to 'zero' MHz. They have carved out a 'hole' here where you will find a 'four-in-a-row' hard rock radio network music service banging away 24 hours a day. If you have access to a spectrum analyzer, you can spot this signal quite easily by disabling the receiver's automatic polarity switching system (if it has one), going to transponder 2 **but staying in vertical polarization.** This will shift the four-in-a-row hard rocker service into the middle (around 70 MHz) on your IF passband which is the equivalent of having it right at the bottom of TR3 if you were tuned there. The service never identifies what it is and sometimes is accompanied by a closely spaced additional FM/SCPC carrier (slightly higher in frequency) which has never been heard modulated.

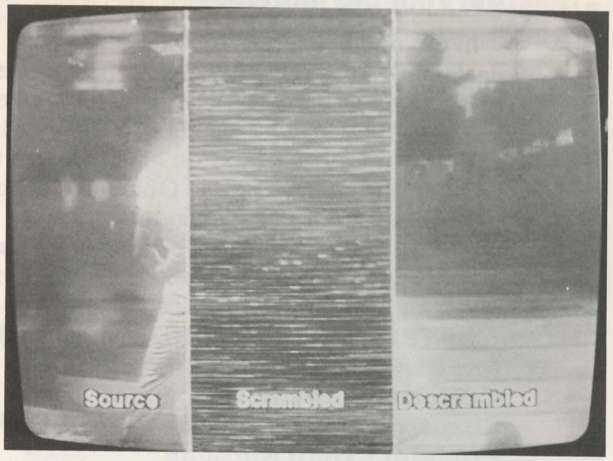
You knew they had WGN really loaded up; now you know about yet another unusual carrier also sharing the WGN transponder. Yes, it is a wonder there is **any power left** at all for the video carrier!

Satellite	Transponder	Designation	Service/ Description	SCPC-66 Tuning Voltage
W4	1(H)		**Mutual Radio**	10.5
			Mutual Radio	19.8
			Mutual Radio	20.0
	2(V)		National Public Radio	0.6
			National Public Radio	0.45
			National Public Radio	0.96
			Handicap/NPR	1.1
			Mutual Radio	1.5
			Mutual Radio	1.9
			Georgia Radio/News Net	2.3
			Georgia Radio/WGST	2.7
			'Elevator Music'	3.0
			IMS News	8.1
			Alabama Net/News	8.4
			National Public Radio	8.7
			Mutual Radio	27.2
	3(H)	MN	U.S. Navy/Master Clock	3.4
			Minnesota Net/News	4.8
			Alabama Info Net	5.3
			Mutual Radio	9.3
			Mutual Advisory	10.2
			Minnesota Net/News	10.6
			Mutual Radio	11.0
			National Public Radio	11.4
			U.S. Navy/Master Clock	12.0
			In Touch Network	12.4
		SE	**Atlanta Braves Net**	12.9
			In Touch Net	13.6
			National Public Radio	13.8
			National Public Radio	14.1
			National Public Radio	14.3
			National Public Radio	17.6
			National Public Radio	18.3
			National Public Radio	19.7
		N	Texaco Opera Net/NPR	20.1
		N	Texaco Opera Net/NPR	20.7
			Mutual Radio	21.3
		MN	Mutual Advisory	21.7
			Georgia Radio Net	22.0
			Georgia Radio Net	22.5
			'Elevator Music'	22.8
	4(V)	MN	U.S. Navy/Master Clock	21.5
			Alabama Radio Net	22.6
			In Touch Net	23.0
			National Public Radio	26.8
			Mutual Radio	27.3
			Minnesota Radio Net	27.8
			Mutual Radio Net	28.3
			Minnesota Radio Net	28.8
			Mutual Radio	29.0
			National Public Radio	29.5
		MN	U.S. Navy/Master Clock	30.0
			In Touch Net	30.4
			Georgia Radio Net	30.6
			In Touch Net	31.6
			National Public Radio	32.0
			National Public Radio	32.5
W3	1(H)		UPI News	12.0
			AP News	18.3
		S On Hour	Wallstreet News	20.6
	2(H)		New 97 Radio	1.4
			Kansas Radio Net	2.3
			ABC Radio News	3.0
			Alabama Radio Net	3.3
			Oklahoma News Net	3.8
			Florida News Net	8.4
			Transtar Radio Net	12.4
			Transtar Radio Net	12.7
			UPI Radio News	28.5
	3(H)		KTRZ Portland (Z100)	3.2
			(religion radio)	5.4
			N. Carolina News Net	9.7
			WRAL (Raleigh)	10.0
			WFBR (Baltimore)	11.6
			Mississippi Radio Net	12.0
			Louisiana Radio Net	12.3
			S. Carolina News Net	13.8
			Brownfield Radio Net	14.8
			Texas State Radio Net	18.0
			Louisiana Radio Net	19.8
		SE	K.C. Royals BB Net	21.4
			Kansas Info Net	22.0
			Oklahoma Radio Net	22.8
			Georgia Radio Net	23.5
			UPI Radio	28.9
			Transtar Radio Net	32.2
	4(H)		KTRZ Portland (Z100)	21.2
			'Elevator Music'	23.3
			Arkansas Radio Net	24.5
			N. Carolina Radio Net	27.7
			Mississippi Radio Net	29.5
			Louisiana Radio Net	30.0
			UPI Total Radio	31.7
	6(H)		'Elevator Music'	1.8
	7(H)		BBN Religion	19.7
			BBN Religion	19.9
	8(H)		KBC Talk Net	29.3
			BBN Religion	30.4
			BBN Religion	30.7

Note: **Boldface listings** are new this month.

COOP/ continued from page 5

practical way for the TVRO dealer world to cope with retrofitting receivers? How would **we feel** if they came along with a new 70 MHz input 'box' that did everything the 'right way'?



There are two possible kinds of 70 MHz input box:

1) A box that simply found the 70 MHz signal coming out of your present receiver's 70 MHz 'IF' and you loop that signal into the 'deluxe version' of Videocipher II. Out of the Videocipher II box you would have descrambled video and audio. Your present

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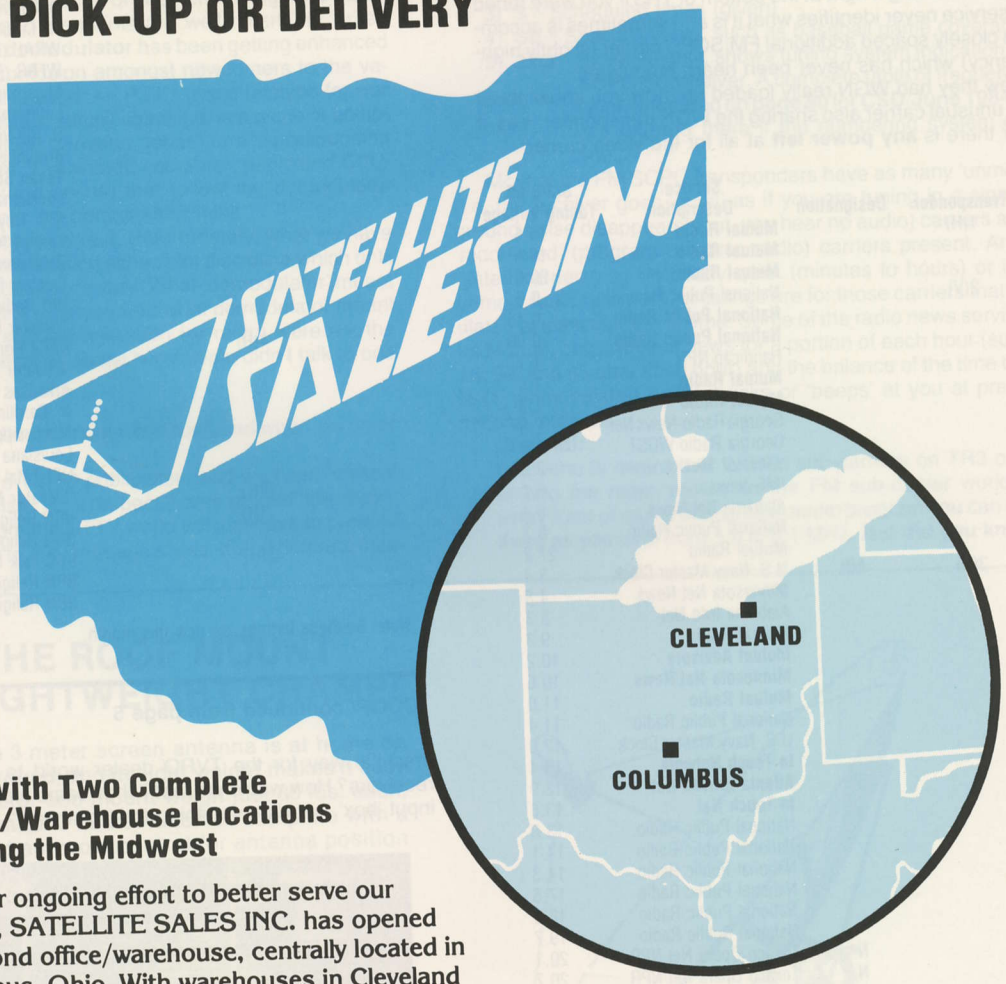

Now with Two Complete Office/Warehouse Locations Serving the Midwest

In our ongoing effort to better serve our dealers, SATELLITE SALES INC. has opened its second office/warehouse, centrally located in Columbus, Ohio. With warehouses in Cleveland and Columbus, we're now no further than a two hour drive from anywhere in Ohio, or, UPS one-day delivery to any location in the region.

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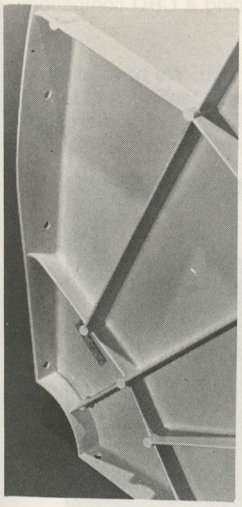
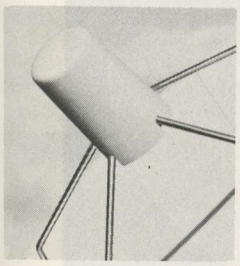
"Good thing we went with a Channel Master dish back in '84. Your picture is as good today as the day we installed your dish."

Built to perform! Built to last!



Precise SMC molding plus machine-aligned and drilled bolt holes produce a more accurate parabolic shape for better reception—and gives you a 4 petal dish that's faster to assemble!



Every 10 ft. and 12 ft. system sold by Channel Master dealers comes with written certification that it will deliver the same fine reception under 2° spacing that it does today. (8 ft. system certification is conditional on cross-polarization of adjacent satellites.)

Dealers give this written guarantee to their customers because we give it to them. You'll give the same guarantee to your customers when you use Channel Master dishes.

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receiver would be a 'tuner' to change channels, and to power your present downconverter. **When you were watching** a CBD system service, you would connect the output of the Videocipher II system to your TV set. **When you were watching** a non-CBD service (transponder), you'd switch back to your standard receiver.

2) Or, you **throw away** your existing indoor unit, keep your antenna, LNA, and downconverter and add a new Videocipher II compatible indoor demodulator. For both CBD, **and,** non-CBD services.

As you can see, we are getting pretty complex all of a sudden. First we **thought** we could stick a tiny box on the end of our TVRO receiver, plug into our video (baseband) output and we'd be in business. **Then we found out** our present receivers won't give us the **quality** of video output with the correct technical specifications so that Videocipher II will function properly. So we begin thinking about either **replacing** the **whole** indoor demodulator portion of the receiver, or at best, merely use it as a 'tuner' to change channels and control the antenna.

Which gets us back to HBO simply writing off **all** of the terminals that exist at the time of their 'sign on,' and starting fresh with **only those new terminals** which have been designed to be CBD capable.

Some dealers **may** have begun telling their customers about HBO's 'CBD.' Some **may already** be telling their customers that the systems they are buying today will be 'adaptable' or 'compatible' with HBO's service. **I would like to suggest you not tell your customers that, starting right now.** Because it is starting to look more and more like that will not be the case.

There is a mixed-silver-lining in all of this. Let's assume that sooner than later, there will be a CBD type of service. That when it begins for real, not only will most of the entertainment channels on G1 be scrambled, but at least the premium service channels over on F3R (HBO, Showtime, Cinemax and The Movie Channel) will, also, be scrambled. In other words, let's assume that if a home viewer **wants movies,** he will **have to get** onto the CBD bandwagon.

With that as a starting place, **let's also assume** we have at least 900,000 C band terminals in operation. And that none, or virtually none, of them are 'convertible' to CBD reception. Now, what happens?

You, the dealer, have several dozen or several hundred or even several thousand customers who suddenly miss their movies. They want the service. **First** you have to explain to them that 'the way it worked out' you cannot convert their receiver, afterall. Nobody else can either (although certainly a few people will try). **They have only one real choice;** a major, new investment in a new TVRO receiver. One that **is** CBD compatible.

They call this 'the after market' in some quarters. The 'market' that comes along **after** you have made the 'big' sale.

Let's see now; you sell Drake and that means the existing receiver has polarization control, audio tuning, . . . all of the usual stuff. That's not so complicated; you find an equivalent model that has CBD built in. Only it will cost about 50-75% **more than** the straight Drake cost the first time around.

That's not the big hurdle. Suppose you have a system from a supplier who builds full dish control into the receiver proper. One of the super-user-friendly receivers that lets you punch up a bird and a channel and sit back. Only now you find that you cannot get a CBD compatible receiver from that firm, not right away anyhow. **Now you have a new problem;** your customer wants CBS. **You have a receiver** that will give him CBD. **But,** the receiver you have for that purpose does not interface with the customer's existing dish mover and polarization control system. Your customer bought top of the line, and now he is about to be penalized because he **can't get** a replacement receiver that offers CBD plus dish control in one box. What do you do? Suggest they 'keep' the old receiver so they can still control the dish? Maybe you sell them on keeping the old receiver for everything-but Galaxy CBD viewing, and talk them into adding a CBD compatible receiver **just for** Galaxy. **Maybe.**

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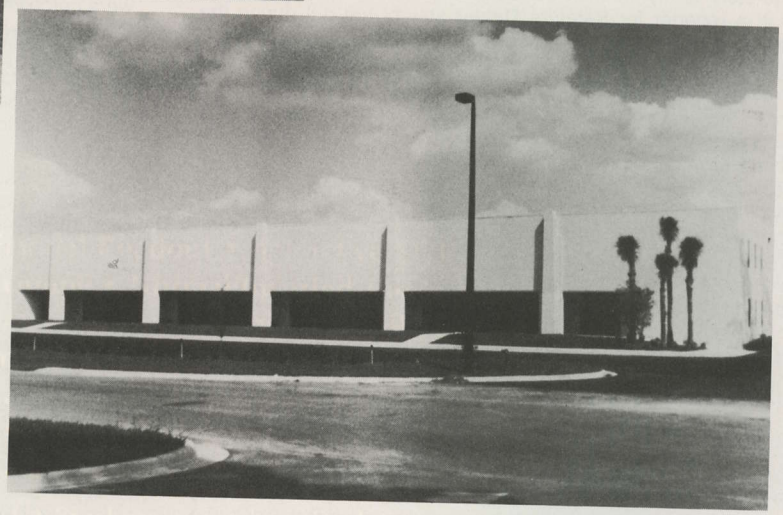

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one another. Now, because of CBD and its requirement that everyone match a certain set of technical standards (which in truth NOBODY meets right now), we are all out in left field someplace wondering how we are going to explain this to our customers. And wondering how we are going to get them to spend another $1,000 or so for 'the privilege' of getting their movie services back!

I am not encouraged by the trend of events. The problems, while not insurmountable, continue to pile up. In fact the 'problem pile' is getting larger, not smaller!

We are not on the home track here yet. We may not be on the 'home track' for a long time to come. We may still be writing reports very similar to this six or 12 months from now.

Scrambling, any scrambling, is fraught with problems. Making the scrambling 'descramble' may turn out to be the smallest of all of the stumbling blocks.

THE 'Right Thing'

When I resigned from the Board of Directors of SPACE last March, I did so because I could no longer tolerate the direction our trade association was headed. Private interests, dominated by a handful of people who saw SPACE as their very own 'marketing tool,' had taken over and board meetings were being framed and run by a clique. I characterized it as 'the clique that had run amuck.'

Staying on the board was to approve the actions of the clique. By getting off the board I felt less constrained to keep 'secret' the activities of the board and more able to openly criticize those actions which I perceived as being detrimental to the **professional growth** of our industry.

I also announced that I was going to attempt to round up a 'slate' of 12 people to run as a group, for the pioneer class seats, to 'wrestle control' of the board away from the present seat holders. I also identified four people now on the board whom I felt were at least trying to do a good job but who were simply overwhelmed by the numbers on the other side.

It was apparent, because I said so repeatedly, that I was going to re-run for the board myself; as a 'Pioneer.' I tendered our corporate check to become a 'Pioneer' and went to work rounding up people for 'the slate.'

Various press reported that I had resigned because of **'a conflict between being a journalist and being a board member.'** Since none of those writing about my resignation even bothered to call me up to ask **why** I did resign, it concerned me that this was 'the story' being circulated. I traced the source of the story to someone in SPACE and elected to leave it alone; this particular person thought it better to say that I resigned because of 'conflict' between being a board member than to **admit** that I had accused him of dishonesty in his handling of SPACE affairs. Hey, you protect your own rear end; right?

The story of my 'internal conflicts' continued. The 'other press' loved it; a reporter for **Satellite Dealer** sought me out during the Niagara Falls show and zeroed in on 'my conflicts.' Not satisfied with my answers, he called me on Provo late in June to ask me again if I was about to reconsider running for the board **'because of the conflicts.'**

Let's see who gets hurt if there are, indeed, conflicts. The conflicts are that if I am on the Board of Directors, and I sit in on the Board meetings, and the board meetings are 'closed to the press' (as, indeed, they are once again), then **I have inside access** to the board meetings while the remainder of the press does not. That means **I** can write about what happened at a Board meeting **accurately** while everyone else in the industry press corps is stuck with after-interviews and press releases. Now, who does that hurt, if indeed I chose to use my inside knowledge in this fashion?

1) It hurts **Satellite Dealer, STV Magazine, Satellite TV Opportunities Magazine.** It means that when we all write about a board meeting, **my reports** will always be better, more thorough, and more accurate; because I was there, and they were not.

Only it doesn't work that way.

The March meeting in Las Vegas **was open** to the press. I sat on the board and Lloyd Covens sat in the audience. I wrote about it and Lloyd Covens wrote about it. Lloyd wrote that I resigned because of 'conflicts.' Lloyd didn't write the truth in this case; he wrote what served his own personal interests the best. Getting me off the board was his own personal interest. Lloyd never bothered to ask me why I resigned; he just used the story to further his own self-interests. But I'm not picking on Lloyd specifically; merely using this as an example that when the meetings **were open,** so that all members of the press were on a 'level playing field,' **we still got distortion.** It is clear to me that whether **(a)** the meetings are open to everyone (as, indeed, I believe they should be), or **(b)** they are open to nobody but it happens that a member of the press sits on the board, or, **(c)** they are open to nobody and no member of the press sits on the board, we will still end up with each writer portraying the event with his own set of prejudices widely displayed.

The simple truth is that I, personally, am not liked by many of the rest of the press. Dr. Ed Meek comes closest to being a 'friend' in the press corps, to me; the balance have various ego problems because **they** didn't start this industry, **and I did.** Chris Schultheiss thinks **he** is the greatest; Lloyd Covens thinks **he** is the greatest, and Dave Wolford . . . well, 'the wolfman' **knows** he is the greatest! Doctor Ed Meek and I share one thing in common; we are the only two in the industry who have professoinal journalism backgrounds. Dr. Ed is typically scholarly and I am typically bashful.

So who suffers when there is 'a' (as in one) journalist on the board, and the meetings are closed to the press? **The other journalists.** Not the industry. The industry gets my views, if I choose to write them, and to date those views have never been challenged by another member of the board. Then they get the 'opposing views' of Covens and Schulteiss who are out there grinding axes and trying to buy favors with advertisers. It makes for as balanced a set of coverage as you are ever likely to get, given the circumstances.

Now move ahead with me to the recently completed nomination process for the SPACE board. At the various caucus meetings held during May and June, I made it a point to suggest openly that I 'not run' for the board. Not if my running was going to create **even one** negative vote for 'the slate' we were trying to put together. To me it was very simple . . . the most important task before us was to find a majority of people who would gain control of the SPACE board through the democratic process. I worked very hard finding people who were qualified, and convincing them they should run. The least important thing, **to me,** was whether **I** was a nominee or not. **I don't have an ego problem.**

Everyone told me I should run, that I would be elected. I agreed, but always said "If it starts to turn the other way, if people start focusing on the 'conflicts' of having a journalist on the board, I will simply not run." Several said that would never happen. I was not so sure.

Well, Niagara Falls was barely over when Chris Schultheiss got on his telephone and began stirring up the dust. First he said that 'running a slate' was divisive; that by identifying a group of people as a 'slate' was merely going to polarize the industry even more; pitting those who were perceived to be in black hats against those who promised they would only wear white hats. Chris wanted the 'slate broken up.'

Why?

If there was no slate, then it would be far easier to 'confuse' the voters and slip in a majority of black hat folks. Chris apparently owes some favors to people who wear black hats and he wallows in this sort of intrigue.

Next he zeroed in on the presence of a journalist, **me,** on the board. I guess it never occurred to him that **he could also run** for the board. Well, maybe it **did occur to him** and he figured he couldn't win. Right after eliminating 'the slate' came eliminating me. He made it plain that he was going to do everything he could to see that **I** didn't get elected. There's only one power greater than a man protecting his pocketbook; that's a man trying to protect his own ego.

And he was modestly successful in his quest. He got enough people talking about my not running that they forgot what the real issues were. See, **even you've forgotten what they are!** I'll remind you; to get SPACE into the hands of straight thinking people who are not using the SPACE board to grind their own axes.

Before we left Niagara Falls, I had decided that it would make the most sense if I ran as a 'Dealer Member' of SPACE. I qualify and it turns out that you can pay SPACE $300 a month and be something called a 'Pioneer Dealer' member if you choose to do so. I chose to do so. If I was going to run, I wanted to run as a 'dealer.' I feel at home,

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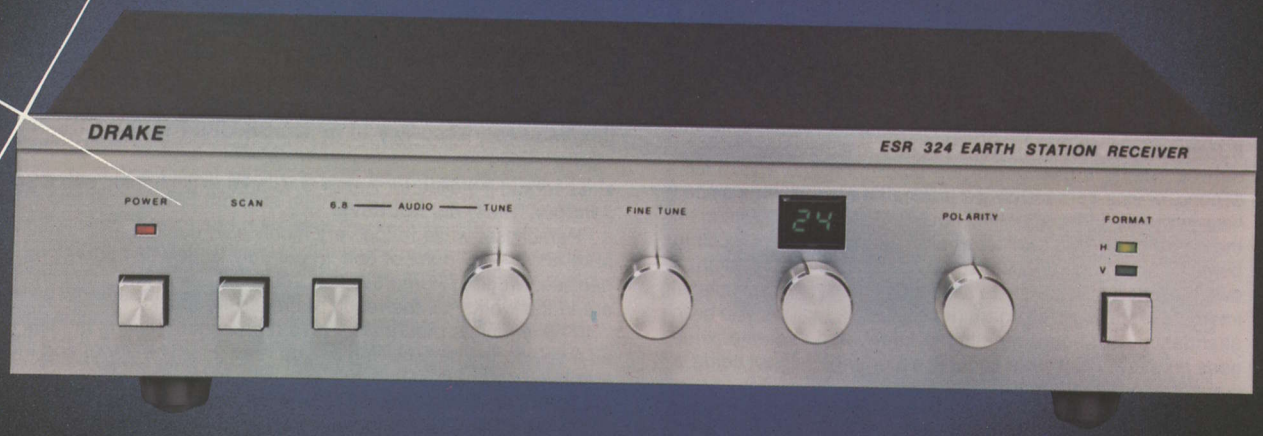

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PIONEER MEMBER OF SPACE

'comfortable,' being a 'dealer.' I think like a dealer, I act like a dealer, and I understand being a dealer. I am not comfortable pretending I am an OEM or distributor.

But should I run at all? Schultheiss obviously thought not. He also wanted to destroy the slate as well, telling George Jones of Conifer that the slate was 'divisive' and 'politically unwise.' But again, he likes guys that wear black hats.

The objective was obvious; 'take away their leader' (perceived to be me), and, 'destroy their group-identity.' Political Science 1A.

Instant chaos. Confused voting members of the industry, and the guys with the black hats slide in; **again.**

In our July 15th issue of **CSD/2** we published the 'platform' of the guys in white hats. It was short and sweet and it essentially said that first you must have fiscal (as in monetary) control of the trade association, and then you decide what projects demand the most attention. And you budget your available funds towards those projects. The same published-platform-page also carried a listing of people who have been nominated, and who agree with that platform. I hesitate to call those listed 'the reform party' but I can't think of a better term at the moment. Schulteiss would call them 'a slate.'

Ny name does NOT appear in that list of nominees.

I have notified Chuck Hewitt that if I happen to be nominated, that I must regretfully decline to allow my name to appear on the ballot. I have two sound reasons for this decision:

1) My presence on the board angers the balance of the press. Their egos cannot handle my presence on the board and this distracts them from the job they have to do; to report fairly and properly on the content of the SPACE board meetings. Their skills are marginal at best; as long as **I** continue to be on the board they will NEVER become responsible journalists. The industry can only profit and grow in stature when the press matures, since so many people just coming into our industry form their first impressions of what we are all about by reading Schulteiss or Covens et al. **I want them to grow up and mature** because that will benefit us all. By staying off the board, I force them to develop good journalism skills and take away their 'thump Cooper on the head' crutch they so easily fall back on.
2) If I am on the board, I have to make a conscious decision between being a member of the board first and a journalist second, or vice-versa. **Being a journalist always wins** since I have a special fatherly instinct about this industry. So being on the board really **is** a conflict when it makes it more difficult to honestly and properly cover some board action (or inaction). I owe my first responsibility to all of the industry, not the special interests of a few on the board (any board). I don't need to be in attendance at a board meeting to know, and evaluate, what goes on there. I can write about it, accurately, without being 'a war correspondent' on the front lines.

My function in getting all of this attention focused on the board was simply that; **to get attention focused.** I have no special leadership qualities that makes me an ideal member of the board. At best, I have a modest sense of history, and what is right and wrong. I can fulfill both, more effectively, by being off the board. **Provided.** Provided we have an **honest** board, a **dedicated** board, a **professional** board. I believe that within the 'slate' of those who seek to reform SPACE (under the banner of 'Friends of SPACE') we have the right people. Now, the trick is to get them elected in the coming weeks.

TUNED Feeds

Just as June was rolling to a close, we had five visitors on Provo from the western USA. Paraclipse's **David Johnson** lead the entourage that included **Gene Campbell** and **Frank Casten** from the Paradigm engineering staff, TVRO dealer **David Lyman** from Utah and an assistant of Lyman's, **David Witbek** also of Utah.

Preceding the quintet had been a massive shipment of TVRO antennas; a new 9 foot Paraclipse, a new 12 foot Paraclipse, and a new 16 foot Paraclipse. We already had 9 and 12 footers on island and both have been in service here for more than a year. The 16 footer brought down was the first of the real production models and it contained some refinements which earlier units (including the one

12 RIBS plus concentric rings insure the large surface maintains the necessary accuracy to be worthy of its 16 foot size.

shipped and installed for Arthur C. Clarke in Sri Lanka; see **CSD** for **January,** 1984) did **not have.**

Paraclipse, while rating very highly with dealers and consumers alike (they were 'number one' in our July issue 1984 survey report), has been working to improve the product. Several important changes are in the works, all the result of dealer feedback.

The antennas brought to Provo represent the same models you, as a dealer, will be receiving as you read this. The 9 foot and the 16 foot have what appears to be markedly improved performance because of something called a 'tuned-feed.' The concept is this:

1) All antenna surfaces have certain physical and electrical characteristics which dictate the type of feed you should be using with that surface.
2) However, virtually all of the larger antenna OEMs have elected to use either **stock** Chaparral or **stock** M/A Com Omni Spectra feeds. Both of these feed lines are, at best, compromises in feed design to make them useable with a wide variety of antenna surfaces. Perhaps, for some antenna, someplace, the Chaparral or the Omni-Spectra **is** exactly the right feed to be used. Right, in this instance, means that if you sat down to design a feed for just a certain antenna surface, you would end up with a feed that looked just like the stock/standard Chaparral or stock/standard Omni-Spectra.
3) For all **other antennas,** there is the opportunity to 'improve the dish performance' by customizing, or optimizing, the feed to the dish f/D and to the surface itself.

The 9 and 16 foot Paraclipse antennas are in the .3 f/D region. The 12 foot is in the .375 f/D region. Chaparral brought out their 'gold ring' as a feed 'insert' to modify the standard (Chaparral) feed for the .3 region dishes. The insert helps but it is an 'appendage' to the basic feed and you would not take this approach if you were designing a

CASTEN (left) **and Campbell** (right) **complete the tie-down on the Paraclipse 16 footer on the Provo test range.** 'A matter of refinements... .

feed specifically for a .3 region dish.

The Paradigm engineering team operates separate from management in the sense that it is in charge of quality control for the full product line. Frank Casten is one of the 'bright people' in the industry with a substantial background in microwave/antenna work. Gene Campbell has a similar 'high-tech' background and they head up the team that works fulltime on making the products assemble and work better, and last longer.

I was delighted to see Johnson's engineering crew with him on this trip to Provo; that told me we were going to do some very critical measurement of system performance. Some people plan a five day jaunt to Provo, use one day to throw up an antenna or 'A'/'B' test some receivers, and then they head to the beach for the next four days. That's what the beach is for, but that is hardly making the best use of the unique test-lab situation we have on Provo.

We took our time assembling and installing, and then testing the 16 footer. We never hooked a television set to the dish until Casten and Campbell were done making measurements. Campbell stated several times **"I don't want to** SEE **a television picture..."** as they adjusted and re-adjusted the dish alignment, declination and offset using signal level meters and a Hewlett Packard spectrum analyzer for their analysis. It was refreshing to see somebody totally dedicated to 'numbers' and not squinting at a TV screen in the bright sunlight wondering whether there were more, or less, sparklies in the picture after each adjustment. In fact, **we never did hook up a TV receiver or monitor** to the dish at the dish proper; when they were finally satisfied that the dish was tracking properly, and it was peaked for maximum performance from F1R in the west to Symphonie in the east (yes, we found it!) they connected up the dish to the previously installed 220 foot long cables and we all went inside to David Ward's den to see what the pictures actually looked like. It was impressive to see a bunch of guys work in this fashion, and not be tempted to lean on a handy TV receiver to witness the reception quality.

The 16 foot Paraclipse is a new standard of excellence in antennas. I found only one design feature that I could not applaud and I heard firm President David Johnson also complain about it when he noticed it. We'll point it all out in our detailed review in next month's **CSD** (September 1 issue). This is the **first dish** I have installed which will go from actual horizon to horizon (0 degree look angle at **both** sides) and **track perfectly** through the entire 180 degree belt. The performance is superb, but that is getting ahead of our September issue report.

There is nothing magic about TVRO antennas; not anymore. The improvements we now notice are mechanical and refinement-level;ball bearings on parts that move,counterweights on the dish proper to insure that the dish will track true and not overload the motor drive, feeds that dare to walk away from the 'easy Chaparral/Omni' selection process and gain a few more percent of overall antenna

COOP/ continues on page 70

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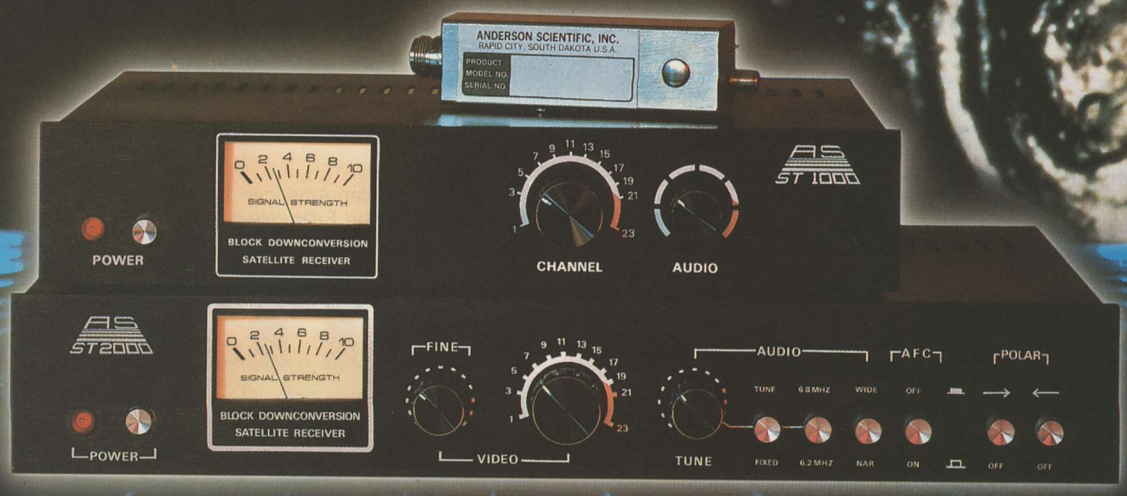

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efficiency. We'll see how all of this came together on the Paraclipse 4.8 meter dish in our September issue.

HARI-KARI Yuri?

For some reason I was deeply shocked when I heard that the Japanese 12 GHz transitional satellite, **Yuri-2A,** was virtually a goner. Yuri was launched in mid-winter and it was done totally with Japanese 'fire power.' On board were a pair of 100 watt TWT power tubes capable of covering all of Japan and the surrounding islands with sufficient signal to make 2 foot dishes a reality. The Japanese had done almost all of the launch work themselves, relying on General Electric for a small amount of help. They had also gone 'off shore' (from Japan) to locate the space-rated 100 watt TWT tubes which were the bird's link back to earth. They acquired these in France from the Thomson (CSF) people.

The Japanese had great expectations for Yuri-2A. It would cover all of the country with two channels of television. As advanced as television service is in Japan, there are still some pockets of people who receive no television and surrounding Japan there are small islands such as Minami and Kita Daito (south of Okinawa) where television had not yet arrived. Well, it was there because the NHK saw to that; **but** it was four-week-old television delivered on videotape. Yuri-2A was the first connection with 'live history' and real-time television.

On one channel the government operated NHK network would broadcast much like CBC does on ANIK to bring live television to people like Norimitsu Kanekawa, the Mayor of Minami Daito. Even on the 'main island' there were pockets of people hiding behind hills and mountains and deep valleys which Yuri would interconnect to the real world, for the first time.

The second channel was the exciting one. This is where the Japanese electronics industry was planning to experiment with high-definition television, pay television, and a host of other advanced television concepts.

The package of two channels would be available to anyone who was willing to shell out the approximately $500 or so (American) required for the dish and downconverter. They were lining up to buy when the first telecasts came out of Yuri on May 1st.

When Yuri was being checked out, prior to May 1st but after it achieved Clarke Orbit position, there had been a failure; **on** of 3 100 watt TWT tubes had quit. Perhaps it WAS the tube; perhaps it was a power supply for the tube (a product of General Electric).

On May 8th, barely a week after two-channel service began, there was another failure; **another 100 watt TWT folded up** and quit. Now Yuri was down to a single channel and those responsible for flying the new national bird were understandably nervous that they would lose the third TWT as well. Of course if it went, that would be it for Yuri.

With the loss of 'channel 2' went the opportunities to experiment. The experiments were important because they would allow the Japanese industries involved to work out both technical and operational bugs for 1100-line high definition television. Having the second channel was also important to testing of a 'pay DBS' channel. But most of all, it was key to making it possible for Japanese equipment builders to test the **marketing strategies** associated with satellite television. Yuri was to be the perfect proving ground; a technical playground, and a marketing playground. At home, where they could find out what worked and what did not work.

When news of the Yuri failures leaked out in Japan, there was immediate reaction. **Toshiba,** which served as the primary Japanese contractor for the satellite, watched its stock drop 425 yen ($1.88) a share shortly after the news broke.

Yuri was 30% a Japanese creation and 70% 'foreign made.' As adept as the Japanese are at almost everything electronic, they have lagged quite a distance behind in the technology of the satellites themselves. The United States and Russia have spun off communication satellites from their military rocket and space programs. Japan is prevented, by war treaty, from doing anything so militaristic as building and launching rockets of the type the U.S. and Russia have used.

There is pressure today to allow Japanese private firms to purchase American built-satellites. Present internal policies preclude that option. The failure of Yuri-2A to operate as planned and hoped is bringing **new pressures** to allow Japan to buy **all** of its satellites overseas cutting out even the 30% Japanese contribution.

I would hope that does not happen to the exclusion of Japan developing their own satellite technology. Everyone seems to agree that the failure in Yuri occured in either the **French built** TWT or the **American built** TWT power supply. An earlier Japanese 12 GHz satellite also failed prematurely, because both of its 100 watt TWTs also quit. They, too, were French built.

Personally, I would much rather see the Japanese government and electronics industry launch an intensive **crash program** to design and build a TOTALLY Japanese satellite system. Right down to the 100 watt TWTs and the TWT power supplies.

I have a growing respect and a considerable admiration for the ingenuity of the Japanese electronics industry. Ten years from now, I would like to see Japanese satellites competing in the world marketplace with Hughes and Ford and the European consortiums. I have this instinctive feeling that if they did, prices would tumble for satellites, and ultimately reliability would be up.

As a short term policy, for the balance of the 80's, it seems logical to me that the Japanese buy American (or European) satellites. Somebody needs to stick birds throughout the Clarke orbit belt over the Pacific, and to me the Japanese are the ideal group to do this. This would allow them to establish the circuits and ground systems to make use of satellites in that region of the world. Having done that, the second generation of satellites for that region of the world would logically be Japanese engineered and Japanese built. Buy outside, as they did for their first computers. Then roll up their sleeves and go to work making their own products in this area smaller, lighter, less expensive to launch and less expensive to operate.

The next satellite explosion will come in low-cost uplinks and small, portable, uplinks; small enough to stick in a suitcase and carry with you on a 727 as excess baggage. **The Japanese could do this.** They would do this. I'm not so sure the American and European satellite designers have the right perspective for this type of work. Not right now, anyhow; they are all too busy becoming multi-millionaires off of the first generation monster birds.

So my suggestion to Japan is just this. **Hang in there;** don't give up your own national satellite space program just because you lost a couple of French TWTs or US power supplies. Take that as the challenge that it is and show us how **you can design** failure-proof power supplies and ten year 100 watt 12 GHz TWTs. **You can do it** and we are counting on you to do so.

FEW Surprises

The STTI Canadian-American Satellite Electronics Show, held June 12-14 in Niagara Falls (New York) sported in excess of 325 exhibit booths, and, they claimed, nearly 200 TVRO antennas. The

FIRST FIND A FOOTBALL TEAM / then put the dish on its mount. The sales literature for this dish describes a one or two man effort in a couple of hours. Somebody forgot to read the manual.

COOP/ continues on page 74

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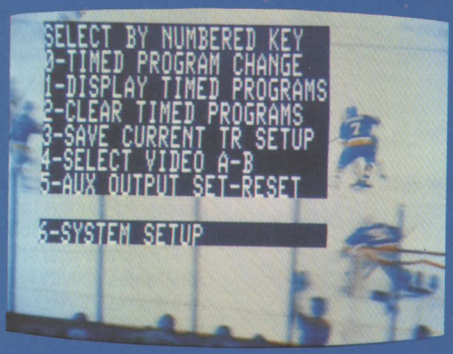
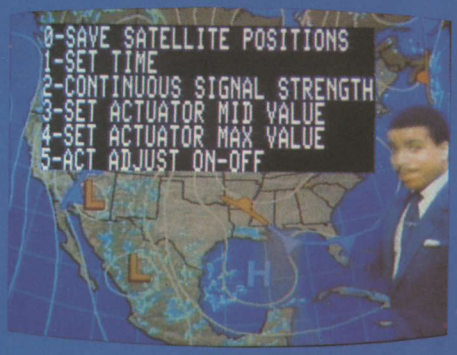
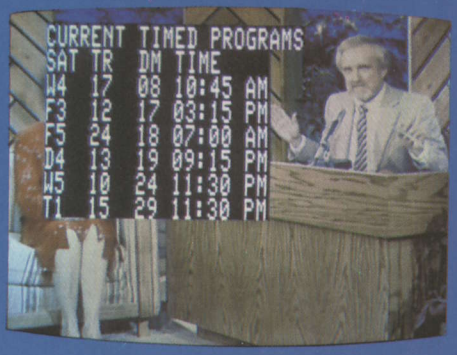
InterCeptor II Satellite Terminal

K.I.S.S. Engineering







8:00 PM

You press button 4

InterCeptor II Functions:

Checks parental lockout memory for this satellite and transponder and decides it does not need the combination; takes control of sync, mutes audio, adjusts polarity; synthesizes transponder 4 frequency, displays "TR4" over video on your TV, synthesizes audio A frequency at 5.80 MHz, synthesizes audio B frequency at 6.80 MHz, switches from narrow to wide deviation, turns on expansion, turns off filter, turns off DNR, unmutes audio, regenerates sync, releases control and awaits your pleasure.

9:00 PM

You press GO TO

InterCeptor II Functions:

Takes control of sync, mutes audio and requests "SAT?" over video on your TV.

You press W 4

InterCeptor II Functions:

Looks up satellite position in memory, decides which direction to go to the satellite and the correct direction to arrive from. Requests "TR?" over video on your TV.

You press 1 1

InterCeptor II Functions:

Checks parental lockout memory for this satellite and transponder; adjusts polarity, synthesizes transponder 11 frequency, displays actuator position and signal strength over video on your TV, tells actuator to go 200 counts past satellite and return to exact position for W4, turns off A and B audio and expansion, turns on filter and DNR, turns on video B aux. input, external descrambler and stereo audio aux. inputs, displays video B on your TV screen, checks sync and regenerates, unmutes audio, releases control and awaits your pleasure.

1:00 AM

You are asleep.

InterCeptor II Functions:

Remembers timed program you entered last month, initiates GO TO G 1 2 0

Turns on your VCR to record programming.

Arunta
Satellite Telecommunications

P.O. Box 15082 • Phoenix, AZ 85060

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(318) 457-1670

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Wichita, KS
(316) 942-9363

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(713) 776-0542

COAST SATELLITE NETWORK
Atascadero, CA
(805) 239-2186

SKY HIGH SATELLITE
Mt. Pleasant, SC
(803) 884-8673

NASCO, INC.
Oklahoma City, OK
(405) 232-5622

UNITED COMMUNICATIONS
Tampa, FL
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Montreal, Quebec, Canada
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Chattanooga, TN 37421
(615) 892-3901

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Burlington, IA
(319) 753-0176

BURTONS SATELLITE
Big Fork, MT
(406) 837-5290

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Berwick, PA
(717) 759-3600

SATELLITE WHOLESALERS
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(702) 733-6284

ELECTRONIC SUPPLY CO.
Mobile, AL
1-800-543-8614

WESTEK DISTRIBUTING
Phoenix, AZ
(602) 582-5955

AMERICAN HOME SATELLITE
Springfield, VA
(703) 569-6755

COOP/ continued from page 70

Niagara Falls auditorium was perhaps the best 'show facility' the industry has experienced to date; plenty of space for the booths and displays, reasonably short antenna line runs, walking distance to nearby hotels. The show, unfortunately, was lightly attended.

And while there was plenty of booth activity, and a modest amount of excitement, 'Gem Finders' were hard pressed to discover much in the way of startling, new technology. The big talk of the show, formal and informal, was the sorry state of equipment pricing, and, the continued plunge to small antennas.

Equipment pricing first.

The show was scheduled in a period of the year when traditionally, retail sales activity is light. Neither June nor July have ever been 'good months' for TVRO sales and we found many dealers who reported their sales this year were especially slack. April and May, we were told, were 'traditional'; running around 50% greater than April and May of 19**83.** June was an abrupt slow down and with the show in mid-June, many dealers were cautious concerning laying out operating capital for stock; even if prices were tumbling.

"If LNAs are under $100 here, I would be gambling if I loaded up on LNAs at this time; they are likely to go down even further!". Perhaps. As **CSD** notes here, separately, the present LNA price-war is largely the result of Japan (Inc.) tooling up for that product with production capabilities in the region of 35,000 per month in June; and rising.

"I simply do not understand why distributors continue to drop prices on LNAs and receivers," lamented a South Carolina distributor. "These guys seem to think that by dropping a ten or twenty dollar bill off an LNA you will get the dealers to stock up. It doesn't work that

BEFORE (top) **and 'during'** (bottom) **in the well designed Niagara Falls Convention center. Plenty of head, leg and elbow room for a change. Why don't they build convention centers like this anymore?**

way!".

Another distributor had one of those better ideas.

"**Think how much better it would be** if distributors, and OEMs who sell LNAs direct, were taking that ten or twenty dollar price reduction and rather than discounting the product, putting those reductions into a common 'kitty' to pay for **consumer awareness advertising** for our industry. If we had 20,000 LNAs being sold in June, and each one held the price to the dealer but put $10 towards a national consumer awareness advertising campaign, we'd have $200,000 to get more customers in the dealer shops"!

Idealistic, of course, given the present 'maturity' of the industry.

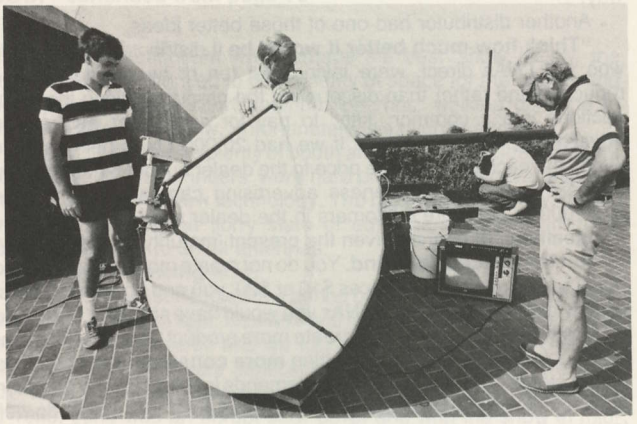
But the concept is sound. You do not create more product flow to dealers by dropping LNA prices $10 or $20; you end up selling almost exactly the same number of LNAs you would have sold ANYHOW had you maintained the price. You create more product flow, and you clear overstocked warehouses, by getting **more consumers** to come into dealer stores. This is a project that demands instant industry attention and the new SPACE board, when seated in September, would do well to move this type of cooperative industry advertising program to the 'front burner.'

Niagara Falls will be remembered because:

1) The show started a 'new trend' in social activities with party-suites and invitation-only events scheduled throughout the show.
2) Inspite of the proximity to the 'populous' Canadian east, the Canadian attendance was not high from Canada. Future show-makers may well decide that Canadian participation in an **American event** is never going to attract large Canadian crowds.
3) There were almost continuous 'caucus meetings' relating to

PLENTY OF OPEN SPACE (Houston Tracker booth, top) **and lots of coordinated color** (BR Satellite booth, bottom). **Free standing, wide-open booths are a sure sign that the industry is moving into a more professional marketing stance.**

FLEA MARKET? Many people have accused **STTI of running their shows as giant flea markets. The** Stereo Video Discount **booth had everything you could possibly want stacked up for sale.**



GEM? Peter Sutro (right) **and Tom Harrington** (center) **inspect a five foot dish scheduled for test on Bermuda where small dishes seem to squeak-by local zoning regulations and actually provide viewable** (if not perfect) **pictures on perhaps a dozen transponders spread across the orbit belt. If you can sell it . . .**

the structuring of the SPACE Board of Directors; the democratic process was at work.

4) And, 'everyone' seems to be in the 4 to 6 foot antenna business now!

Of the 180 claimed antennas, none were over 16 feet in size although many-many were under six feet. Each had their own claim to performance and you got a different story from each. Some chose to sit on Galaxy One because of the perception that G1 signals are hottest; others went for the 'tougher' F3R pictures and made the inevitable comparison that **'their** (4) (5) (6) foot dish **worked better** because it was displaying F3R pictures(!).' Retail-level packaging, offering small dishes, simplistic mounts, 100 or 120 degree LNAs and (typically) low-cost BDC receiver systems were under $1,000 all over the lot. Installation was characterized as 'simple' but was typically not included in the price.

Direct selling to consumers was another frequent conversation topic. Professional dealers **don't like it,** and wonder what **they** can do to combat it. Some admitted they were now handling $995 retail-priced 'do-it-yourself' terminals and selling them as a defensive position against competitors who had adopted the same practice. You could calibrate a professional dealer from the not-so-professional quite easily; the pro's **still believe** in 8, 10 and 12 foot systems, properly engineered and properly installed, in the $3,000 price range. The 'amateurs' are beating the bushes offering low grade system

CLEAR CHOICE

For a crystal clear picture, choose a Lowrance System 70 Satellite Receiver

Lowrance System 70 receivers truly have no equal for picture quality. Colors are true and vibrant — not that washed-out look so common in other receivers. Lines are clear and distinct — not fuzzy. Low threshold makes 1000-foot runs a snap. And the audio is crystal clear. No wonder that Lowrance, one of the world's finest electronics companies, is proud to put its name on the new System 70 models.

Look over the multitude of easy-use features. With detent tuning, you click right to the channel you want — no fishing around. A polarity push-button with separate skew adjustment makes polarization changes easy and works with the Polarotor 1, Omni polarizer, or a Ferite device. Fixed and variable audio tuning with wide or narrow filter selection makes audio tuning extremely versatile. The System 70 models are equipped with scan tuning, 125 feet of pre-made cables, built-in modulator, AFC defeat and signal strength meter, so installation and antenna positioning are a breeze.

Two Models to Choose From

The System 70S has all the remarkable features of the standard 70X, plus superb stereo reception with discreet and matrix capability. The stereo reproduction will please the most discriminating listener, and it's easy to tune with independent subcarrier A and B tuning capabilities.

For System 70 dealers, we provide outstanding support with product brochures, posters, the popular customer question-and-answer brochures AND the best warranty/service in the industry.

Lowrance System 70X and 70S. They're the clear choice in satellite receivers and downconverters.

Please send me more information about Lowrance System 70X and 70S.

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

Mail to Dept. #5352084

LOWRANCE ELECTRONICS, INC.
12000 E. SKELLY DR., TULSA, OK 74128

TRADITIONAL overview shot of the Niagara Falls antenna farm, shot from the CSD **helicopter. Our thanks to** Tim Harrington **for his usual excellent coverage of the show's events both on the ground and in the air.**

packages at cut-rate prices.

Rumors were everywhere, the product of people with too much time on their hands and not enough booth traffic to keep them busy. Several brand name firms were quitting the business, **if you believed the rumors.** We found no verification for **any** of those being tossed about. And we checked. Others seemed too busy 'repeating' the rumors to bother checking with the firms named.

Not too many products, new or first shown nationally in Niagara Falls, caught our eye. Here are a few of those that did:

1) **Scannar Satellite Systems** (P.O. Box 571, Massena, N.Y. 13662; 315/764-0775) displayed a new receiver which if placed into volume production will be a serious contender for top-of-the-line honors.

The designer responsible is **Daniel Bernasi** who many years ago brought out the Canadian Teknimat receiver. Bernasi is generally accorded recognition as one of, if not indeed **'the'** best video engineer in the field. The Scannar receiver is a BDC package with a 950-1450 MHz IF. The IF is 25 MHz wide and channel tuning is quartz synthesized. Audio tuning is also quartz synthesized. The hand held remote gives full control over everything including Westar/Satcom/Galaxy polarity reversal, automatic or programmed audio sub-carrier detection, full stereo matrix or discrete tuning. The front panel of the Scannar has digital display of the transponder number, the audio sub-carrier frequency, the mode (matrix or discrete), the format (Satcom or Westar) plus a bar graph for signal level. The remote is infrared. The unit has UL and CSA approved powering, optional 12 GHz BDC front ends and uses a saw filter in the IF for selectivity. Very impressive, not 'low end,' and the SR-1000 will do well at the Professional Dealer level.

2) **Stead Corporation** (818 Floyd Street, Louisville, Kentucky 40203; 502/589-1343) also had a top of the line high performance receiver package (the Thoroughbred 110-S).

This receiver uses dual conversion (that **alone** is unusual these days!), and attention has been paid, at least in the specification sheets, to the video performance parameters. This receiver is in the same apparent family as the fabled 'Earth Terminal' unit and several people noted that it has the general design philosophy that one might expect to find in a Clyde Washburn project. It lacks some of the extra bells and whistles one finds on the new crop of receivers, but apparently pays good attention to the quality of the video (and audio) that the customer sees.

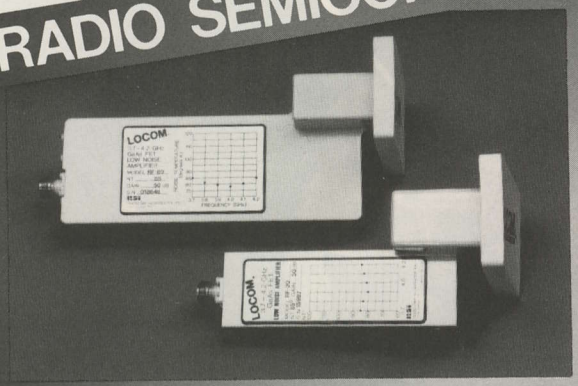
3) **Viewstar, Inc.** (55 Milner Avenue, Scarborough, Ontario, Canada, M1S 3P6; 416/298-9919) had another of those top-of-the-line receivers featuring block downconversion with an IF in the 950/1450 MHz region. Viewstar seems to have done their homework properly in offering a handheld infrared remote package designed for multiple-receiver systems.

The 950-1450 MHz high IF is distributed via cable to one or more individual receivers. The receivers use a 134 MHz second IF (rather than 70 MHz). Both video and audio frequencies are quartz synthesized. The audio system is matrix stereo or **mono** and tunes 5.0 to 8.5 MHz in 10 kHz steps. The receiver has a complex (but not complicated) handheld that includes parental lock-out features. A 12 GHz front end (BDC) is also available and it is 'CANCOM compatible' for 12 GHz services of the future as well as the present 4 GHz 'CANCOM' services.

COOP/ continues on page 81

LOCOM® RADIO SEMICONDUCTOR

BLOCK CONVERSION SYSTEM



Quality Polarotor II Controller available as an Option.

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BLOCK CONVERTERS,* LOW NOISE AMPLIFIERS, & BLOCK RECEIVERS*

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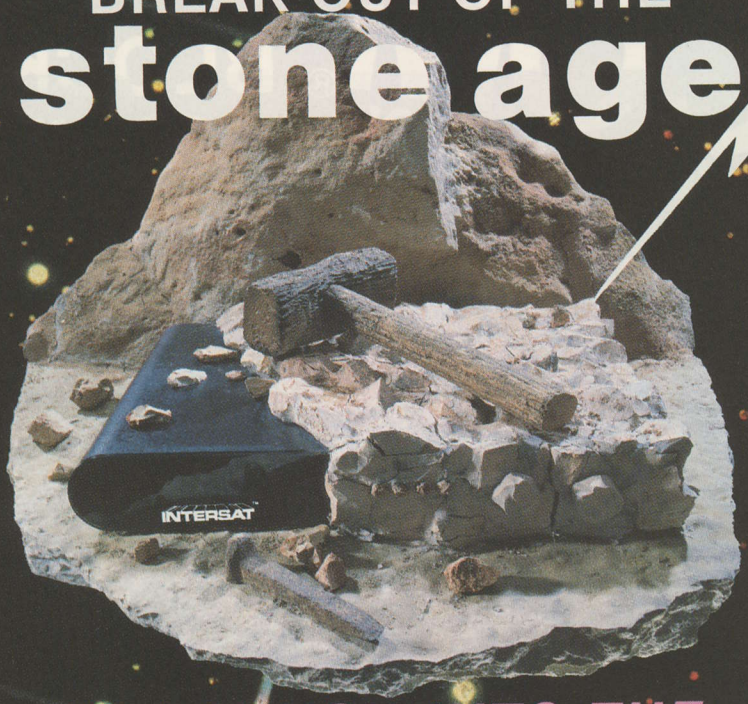
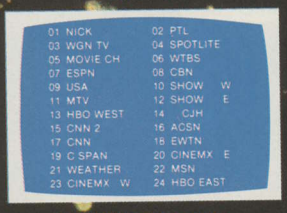


AND LAUNCH INTO THE SPACE AGE

Parental Lockout

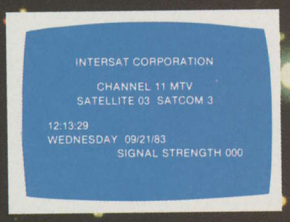
Selects Lockout, Power On, Power Off



Available Channels On Each Satellite

INTERSAT™

IQ-160 RECEIVER



Channel, Satellite, Day, Date, Time

Available Satellites for Viewing

8 Modes of Tunable/Audio
12 Watts Stereo
Programable Satellite Locations, Addressable Programing

If the touch of one finger will not operate your entire satellite receiver system, you are living in the Stone-age. Trade in your stone-age electronics for the IQ-160 space-age electronics and receive a $500 trade in allowance.

Contact your nearest participating distibutors for details on how you can launch yourself into the Space-age.

$500 TRADE IN ALLOWANCE

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205-355-1234

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Marina DelRey, CA 90291
213-822-0100

CANADA
Canadian Microtech
Box 381
Ingersoll, Ontario, Canada N5C 3V3
519-485-3201

National Electric
901 Winnipeg Street
Regina, Sask., Canada S4R-1J1
306-569-2882

COLORADO
Interstellar Systems West
2008 N. 75th
Boulder, CO 80301
303-665-7499

FLORIDA
E.T.'s
50 North Trail
Osprey, FL 33559
813-966-6916

GEORGIA
Satellite Marketing (NORTH)
1516 Municipal Parkway
Douglasville, GA 30134
404-942-2461

ILLINOIS
Communications Unlimited
Courthouse Square
Toledo, IL 62468
217-849-2011

INDIANA
Flame Products (CENTRAL)
1508 1st Avenue
Evansville, IN 47710
(IN) 1-800-742-3778
(OTHER) 1-800-457-3761

Starlight Antenna
714 West Colseum Blvd.
Fort Wayne, IN 46808
219-485-6148

Total Sounds, Inc. (SOUTHWEST)
700 N. Weinbach
Evansville, IN 47711
812-477-6456

KANSAS
Satelink
Third & Drumm
Kiowa, KS 67070
316-825-4036

LOUISIANA
Sat Specialists (SOUTH)
414 Columbia Street
Bogalusa, LA 70427
504-735-9915

MISSOURI
Hyde Ind., Inc.
Old Hwy. 36
Bevier, MO 63532
816-773-6911

Dockery Satellite (WEST)
HCR 67
Warsaw, MO 65355
816-438-6192

MONTANA
Burton Satellite, Inc.
4994 Highway 35
Big Fork, MT 59911
406-837-5290

NEVADA
Challenger
4601 W. Sahara, Suite I
Las Vegas, NV 89102
702-367-2000

NEW YORK
Satellite Video
P.O. Box 247A
Star Route 247A
Palenville, NY 12463
518-678-9581

OHIO
Porter Communications, Inc. (EAST)
50 North 11th Street
Newark, OH 43055
614-349-7715

Classic Satellite
1391 North Cable Rd.
Lima, OH 46505
219-483-0553

PENNSYLVANIA
Satellite Video Services of PA (WEST)
317 E. Pleasant Valley Blvd.
Altoona, PA 16602
1-800-242-3860
814-942-5003

TENNESSEE
American Video Corp. (EAST)
5300 Memorial Drive
Kingsport, TN 37664
615-323-4274

UTAH
Rocky Mountain Satellite System
2040 E. 3300 South
Suite 4
Salt Lake City, UT 84109
801-484-4621

VIRGINIA
Vess Distributing & Manufacturing
P.O. Box 552
25 Lower Street
Buchanan, VA 24066
703-254-1776

COOP/ continued from page 78

The obvious receiver trend is to block downconversion which allows the dealer to 'stack' two or more receivers on the same antenna, using dielectrically stabilized first downconversion oscillator(s) and quartz referenced video and audio frequency selection.

Of the three noted here, there are subtle variations in the audio demod systems (Stead offers three audio IF bandwidths; Scannar offers a single 300 kHz bandwidth and Viewstar a single 330 kHz bandwidth) with the obvious problems associated with super-wide audio deviations (Disney or Nashville) and with super-narrow audio deviations (various sub-carriers found on F3R's TR3 and 6).

4) **Pro Brand International, Inc.** (P.O. Box 7931, Columbia, S.C. 29202; 803/732-0027) displayed a Taiwanese manufactured dish controller system with interesting features and good pricing.

To date, the success rate with off-shore created 'dish movers' has not been good. Units have been poorly conceived, poorly manufactured, and distributors and dealers buying same have often regretted getting involved. Sooner or later the shoddy designs being created (or copied) there were likely to improve and the Astropro model Z-500 dish controller **may be** the first of that wave.

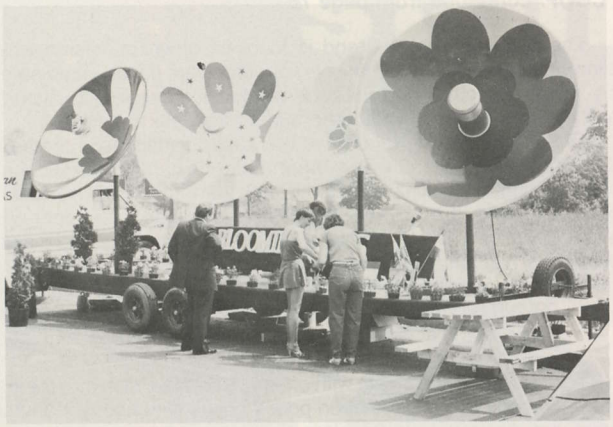
With an 11-lot price of $385 each (FOB South Carolina) the Z-500 features a microcomputer approach to selecting any of 81 separate program positions. Operation is straightforward (S for Satcom, 1, 2, 3 or 4 for individual bird, etc.) and the alpha-numeric display tells you where you are, and when you get there. Parental lockout of certain satellites is included plus a physical key-lock will hold the dish on a single satellite so that unauthorized people cannot 'play.' All six of the antenna movement functions are individually displayed on the front panel.

HIDE IT/ somebody has actually created this 'bubble' to hide **your customer's dish! If local zoning ordinances don't allow** 'dish antennas,' **maybe they don't address 'fiberglass/plastic bubbles.' If you like this idea,** there's a bridge in Brooklyn . . .

The drive portion seems to be a well thought-out 32 VAC Acme type actuator. An 18" throw is standard; other throw lengths are available, or are promised shortly. A full function infrared remote control is also available as an option.

Uniden (Corporation of America) blew the socks off of those attending their Monday night reception and program. One of the most imaginative fast-paced slide shows ever seen held a packed room enthralled for nearly 30 minutes. Uniden's message was clear; they are **here** with a total commitment to the industry, they intend to **make** big waves in the consumer marketplace, and they also intend to keep a rapid succession of new products **coming** into North America over the next several years.

And finally, this observation on booth designs. This industry began as a 'table-top' display business; early exhibitors brought their products, set them down on table tops, and stuck around a few sheets of literature. And we grew up; highly fashionable, elaborately conceived booths now run to $50,000 (and up!) for the free-standing types that



ORIGINAL ART/ Commander Satellite planted a 'dish garden' **along the back row of the display lot and called it** 'Our Blooming Industry.' **Double entendre intended.**

occupy four or more actual booth spaces. Those big bucks for booths have to be returned, of course, with sales. As you might suspect, dollars for booths end up somehow being factored into all of the equipment each firm sells. In a highly competitive environment, such as we have, one expects to see larger, more elaborate booths at each successive show. Niagara Falls brought out only a handful of **new** booth designs but we can all expect to see even larger, even more expensive booths at the September Nashville show. The industry continues to mature, even in strange off-beat ways!

UNIDEN PARTY brought out the ladies in their finery. Canada's Frank Ogden (left), **AVCOM's** Pat Hatfield, Joan Costello **from Your Earth Station, Ltd.** (Duncan, BC), **John Grayson** (behind Coop) **and Coop. Somebody needs to spark-plug a** 'Women In TVRO' (WIT) **group so we get the ladies talking to each other on a regular basis!**

NO SHORTAGE Likely

The smell at Niagara Falls was not pleasant (see this issue for full Niagara Falls report). It was't "Love Canal's" proximity; it was something far more ominous. The warehouses were full, and getting fuller.

The Boman booth offered 50 dB gain/120° LNAs for under $100. You could find 85 degree units under $200 and complete receiver packages with down converters were selling to dealers in small quanities between $200 and $250.

For every fall we can remember, there has been a sudden and dramatic sales-curve-hike starting around the 15th of August. There is something 'magic' about fall and television equipment acquisition. And for every fall we can remember, there has been a shortage of equipment; LNAs and receivers first, antennas next.

I do not see it happening this fall. Not only are the warehouses already full, but the volume of equipment scheduled to be coming into the country from off-shore starting in August is almost awesome. Allow me to illustrate with a few numbers.

Let's take LNAs. Not every LNA has an 'isolator' in it. An isolator is that fat gadget just behind the mouth, between the probe in the mouth and the first GaAs-FET amplifier stage. An isolator, for those of us coming from the 'old school' of LNA design, is mandatory. Not every LNA designer uses isolators so the numbers to follow are even more meaningful.

I have a contact in Japan; a firm that manufactures **all** of the isolators made in Japan for the 4 GHz service. If you want an accurate count of how many LNAs are being made in Japan, for shipment to North America, the counting exercise is very simple; simply ask my friend 'Mr. K.' how many isolators he shipped this month. He tells me.

In June he built and shipped 35,000 C band LNA isolators. In July he built and shipped 40,000 isolators. He is planning to ship 45,000 isolators in August. None of those isolators, to the best of my knowledge, are coming to North America alone; that is, Mr. 'K.' does not sell his isolators to **US** LNA **manufacturers.**

Let's slide back to page 12 of **CSD** for July and calculate using the Dealer Survey statistics how many terminals were probably sold during June and July. Using our 3,322 dealer base we have around 22,000 real terminals selling during June, and perhaps 20,000 (tops) in July. We are on slightly dangerous ground **with July** since the month is barely 50% gone as we write this, and it shows no sign of even being the equal of June at this particular point in time.

Now take either number. Take 22,000 for June and compare that to Mr 'K.' and his 35,000 C band isolators. Those isolators didn't end up in LNAs, landed in North America, **in June;** that took another 30 days or more. So his June isolator production would at best equal our July Japanese LNA production. It might even equal our August North American/Japanese LNA product **availability** level, **allowing for shipping time.**

This tells us that there is greater Japanese LNA production going on than we are presently using LNAs. Of course not all of the LNAs we are using come from Japan. If we can believe the May 1984 industry survey numbers, no more than 31% or so of the total LNA use here comes from Japan. Or **did come** from Japan. I suspect by the end of this year, **that number may change remarkably.** So if the **Japanese LNA production** is greater than **our total use rate** of LNAs, and the early summer Japanese LNA percent-of-market was around 31% or so, what does that say about LNA availability? And price?

It says that if financial pressures continue to mount, several LNA suppliers will have to get out of the business. Some of the US brands may simply drop out of the market, unable to compete with the Japanese production abilities. Some of the Japan-to-America importers are being stung so badly by eroding prices that they will **also drop out** (you can't last long when you signed a contract for 3,000 LNAs a month at $175 each back in January, and you suddenly find your competition selling them for **$70 less** than **you pay** for yours!)

And all of this says that prices will bottom out and hang in there around the $100/$150 region until the oversupply gradually wears away. There is not going to be a shortage of LNAs this fall.

How did this happen?

'Unrealistic projections' believes Mr. 'K.'. 'US suppliers and importers didn't want to get caught being short of TVRO parts for the fall selling season. We have been ramping up for the fall of 1984 since last fall. The US marketing people have made improper projections.' Mr. 'K.' is overly generous. **U.S. marketing people may have blown it.**

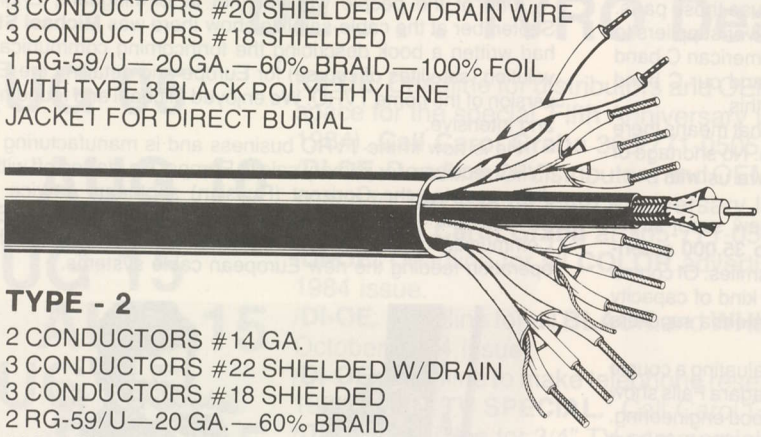
We worried early in the winter about parts shortages; critical parts which would hold up receiver and LNA production. Just as the isolator people in Japan (our Mr. 'K.') got swept up in this whirlpool, so too have the receiver parts people. But there is more to the story than simply improper projections.

We also worried last winter about the impact of the Japanese (and to a lesser extent, European) Ku band or DBS projects. In particular, we all expected big things **in Japan** as their new Yuri satellite brought two fulltime channels of TV to all of Japan, and the surrounding areas (such as Korea). We expected microwave parts (transistors, capacitors, et al) to be in very tight supply **because of** the demand for **hundreds of thousands** of Yuri receivers. **Then Yuri all but quit**

Satellite Total Control Cable

TYPE - 1

2 CONDUCTORS #14 GA.
3 CONDUCTORS #22 SHIELDED W/DRAIN WIRE
3 CONDUCTORS #20 SHIELDED W/DRAIN WIRE
3 CONDUCTORS #18 SHIELDED
1 RG-59/U—20 GA.—60% BRAID—100% FOIL
WITH TYPE 3 BLACK POLYETHYLENE
JACKET FOR DIRECT BURIAL



TYPE - 2

2 CONDUCTORS #14 GA.
3 CONDUCTORS #22 SHIELDED W/DRAIN
3 CONDUCTORS #18 SHIELDED
2 RG-59/U—20 GA.—60% BRAID
100% FOIL
WITH TYPE 3 BLACK POLYETHYLENE
JACKET FOR DIRECT BURIAL

AVAILABLE IN 330' & 1000' SPOOLS

330 FT. SPOOL @ 54¢ FT.
1,000-5,000 FT. @ 48¢ FT.
5,000-10,000 FT. @ 44¢ FT.
10,000-50,000 FT. @ 42¢ FT.

COAXIAL CABLE

RG-6/U (FOIL & BRAID)	$ 65/M'
RG-8/U (95% BRAID-FOAM)	$210/M'
RG-59/U (96% BRAID-PE)	$ 89/M'
RG-59/U (75% BRAID-FOAM)	$ 65/M'
RG-59/U (FOIL & BRAID)	$ 49/M'
RG-59/U DUAL (FOIL & BRAID)	$105/M'
RG-11/U (96% BRAID-PE)	$210/M'
RG-213/U (96% BRAID-PE)	$240/M'
RG-214/U (TINN. COPPER BRAIDS)	$550/M'
RG-214/U (SILVER BRAIDS)	$1300/M'
RG-217/U (96% BRAIDS-PE)	$600/M'

TYPE 'N' CONNECTORS

UG-21/BU (MALE)	$2.25/each
UG-21/DU (MALE)	$2.00/each
UG-57/BU (DOUBLE MALE)	$3.10/each
UG-29/BU (DOUBLE FEMALE)	$3.10/each
UG-27/CU (RIGHT ANGLE)	$4.45/each
UG-23/BU (FEMALE)	$3.00/each
UG-58/AU (CHASSIS)	$1.60/each
'N' CRIMP MALE	$2.10/each

MULTI CONDUCTOR CABLE

2 COND. #20 SHIELDED	$ 65/M'
2 COND. #18 SHIELDED	$ 79/M'
3 COND. #22 SHIELDED	$ 75/M'
3 COND. #18 SHIELDED	$105/M'
2 COND. #16	$ 80/M'
2 COND. #18	$ 49/M'
2 COND. #20	$ 39/M'
3 COND. #22	$ 40/M'
3 COND. #18	$ 79/M'
4 COND. #22	$ 49/M'
4 COND. #20	$ 69/M'
6 COND. #18	$135/M'
8 COND. (2-18/6-22)	$129/M'
8 COND. (2-16/6-18)	$230/M'

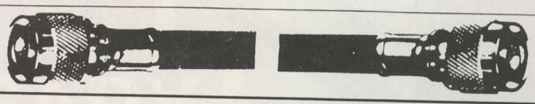
'F' CONNECTORS

F-59 W/¼" RING	9¢ each or 69/M
F-59A ATTACH.	10¢ each or 78/M
F-59 ALM LONG ATT.	11¢ each or 99/M

TOLL FREE ORDER LINE —
(800) 423-2322
(914) 947-1554 N.Y.
-1555

cz labs

P.O. Box 95-55 Railroad Ave.
Garnerville, New York 10923



RG-213/U COAX CABLE JUMPERS
TYPE 'N' CRIMP PLUGS EACH END
COMPLETELY WEATHERPROOF WITH SHRINK TUBING

LENGTH	1-49	50-99	100-199	200 or More
8 Feet	$ 9.25	$ 8.75	$ 8.25	$ 7.75
10 Feet	$ 9.50	$ 8.85	$ 8.50	$ 7.95
12 Feet	$ 9.85	$ 9.35	$ 8.85	$ 8.35
15 Feet	$10.50	$ 9.95	$ 9.50	$ 9.00
20 Feet	$11.75	$11.50	$11.00	$10.75

— ALL LENGTHS AVAILABLE —

(see Coop's Comment, this issue). Leaving the microwave parts lines filled and no wide spread Yuri-receiver production to use those parts. This prompted Japanese and other Far Eastern receiver suppliers to shift gears in mid-stream and climb onto the North American C band wagon train. **They need a place to 'dump parts'** and our C band receiver market looks like an attractive place to do this.

There is no shortage of parts in the Far East. That means there will be no real shortage of receivers in North America. No shortage of receivers and no shortage of LNAs. What's that leave us with?

Antennas and actuators.

David Johnson of Paraclipse talks about his new super-large, super-automated antenna production facility. **'Up to 35,000 antennas a month if we really crank up to full speed'** he smiles. Of course nobody else even comes close, but if we have that kind of capacity from a **single** U.S. supplier, well, how many other antenna suppliers do we really need?

Actuators remain a question. I am presently evaluating a couple of Far Eastern actuator products; units I saw at the Niagara Falls show which impressed me for their attention to detail and good engineering. No, I don't think we will need to worry about actuators either. At least not after this fall, even if we somehow come up short during October and November.

There will be **some shortage** of **some name brands.** These shortages will be primarily the result of poor management decisions, and not because of any raw parts shortages. But to offset those isolated shortages, I foresee warehouses crammed with lesser known brands on **both sides** of the Pacific.

We need a big (BIG!) **market this fall.** We need something we do not yet have in place; a gigantic consumer awareness campaign of what TVRO is and what it can do for home entertainment. We need to clear out those warehouses, lose a few suppliers to attrition, and start our pricing structure all over again. **We have gone far too low for no sound reason.** The fall of 1984 is likely to be remembered as a 'shake out' period. And for the first time, you are probably going to have access to **all** of the equipment you need, and want, during your busiest sales period of the year.

EUROPEAN Update

One of the people we first met in Birmingham, England last September at the cable-satellite show there was **Michael Stone.** He had written a book describing the forthcoming communications revolution (satellites of course) for Europe and detailing the European version of the home TVRO. We enjoyed Michael and found him bright and intensive.

He is now in the TVRO business and is manufacturing a line of TVRO receivers for primary sale in Europe. He started off with a small dish receiving the Gorizont (Russian) spotbeam service and has graduated to the big time stuff including the new ECS-1 (European Communications Satellite) and Intelsat V 11 GHz video which is in operation feeding the new European cable systems.

MICHAEL J. STONE of Satellite Technology Services, Ltd. (Baugh Farm, Church Lane, Downend, Bristol, England BS16 6TB; [0272] 560775) **explains to Coop his chart of transponder activity on ECS-1 and Intelsat V.**

IMPORTANT DATES FOR ALL DI/OE . . . Distributors and OEMs DE . . . TVRO Dealers

AUG 05 /**DI-OE.** Deadline for distributors and OEMs to order two or four **COLOR** advertising space for the special 'Fifth Anniversary Issue' for TVRO (to be issued October 01, 1984). **Call Carol Graba** 305/771-0505.

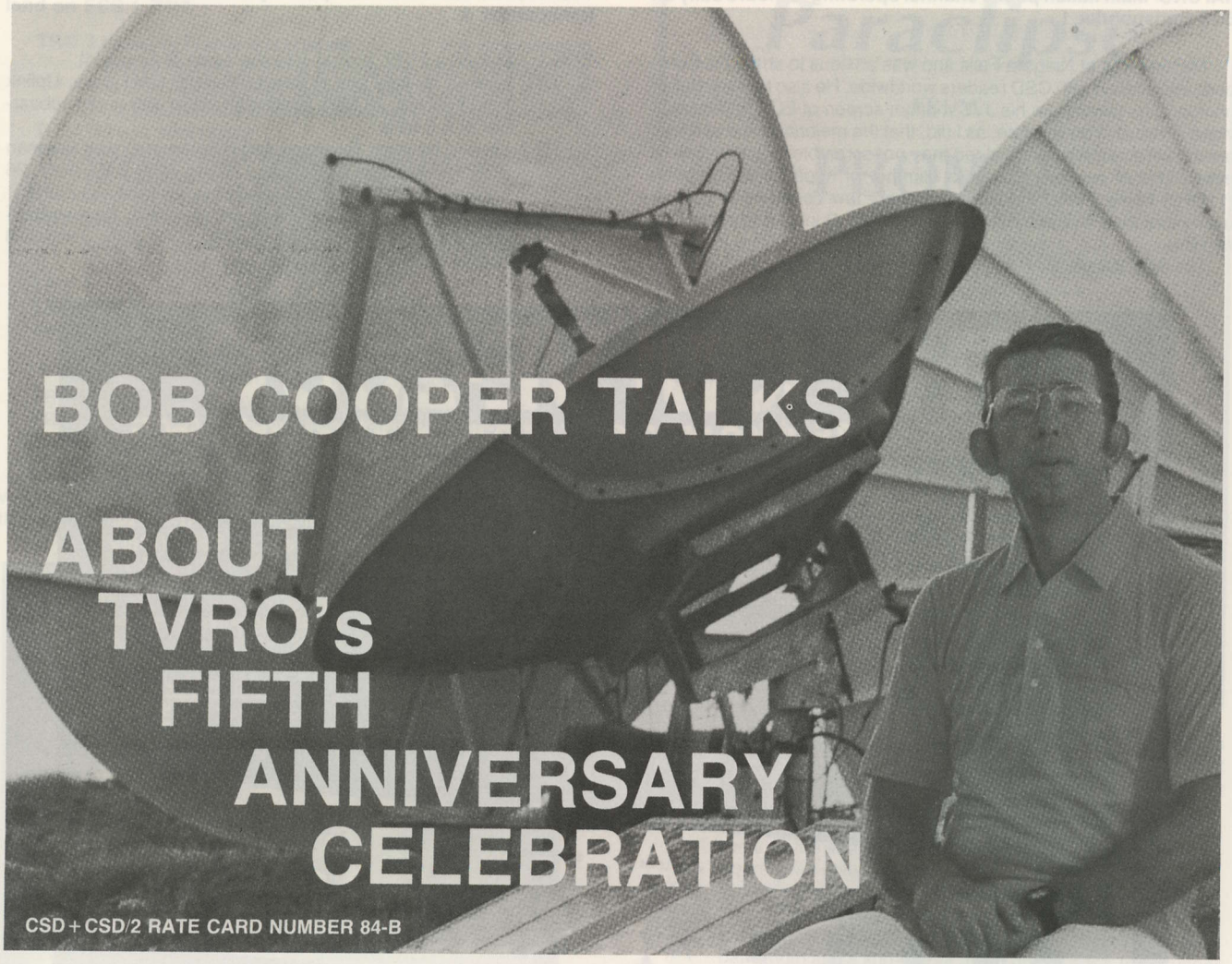
AUG 10 /**DI-OE.** Deadline for distributors and OEMs to order **BLACK** and **WHITE** advertising space for the special 'Fifth Anniversary Issue' for TVRO (to be issued October 01, 1984). **Call Carol Graba** at 305-771-0505.

AUG 15 /**DI-OE.** Deadline for all **COLOR** advertisements to reach CSD office for October 1984 issue.

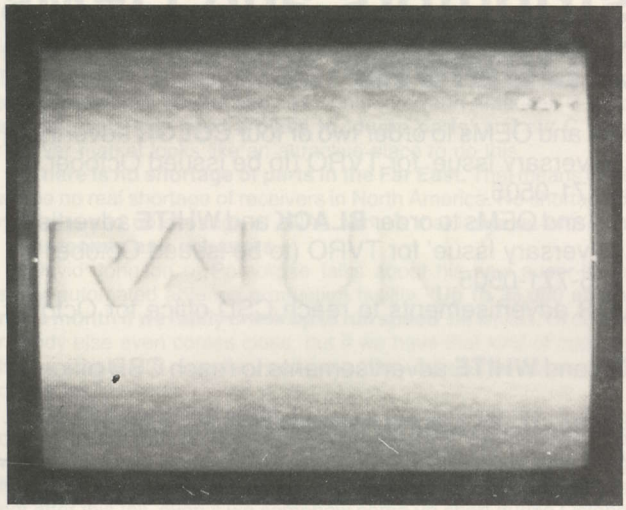
AUG 15 /**DI-OE.** Deadline for all **BLACK** and **WHITE** advertisements to reach CSD office for October 1984 issue.

AUG 15 /**DI-OE.** Deadline to make telephone reservation for 'advertising time' within October 18th **'TVRO TV SPECIAL.'** Call Carol Graba at 305-771-0505.

SEP 15 /**DI-OE.** Deadline for 3/4″ TV commercials for two-hour TV special to arrive at CSD offices in Fort Lauderdale.



TVRO DEALERS are also reminded that your 1/8th page advertisement for the October 1984 'Fifth Birthday Edition' are due in Fort Lauderdale on or before August 10th. If you have any questions, please contact Carol Graba at **305-771-0505.**



RAI UNO/ Main Italian public channel operating 13 hours daily on ECS transponder 1.

TV5/ French cable-slanted specialty channel operates on ECS transponder 4.

Michael was at Niagara Falls and was anxious to share his European information with CSD readers worldwide. He also had a fistfull of photographs taken from his JVC monitor screen of ECS and Intelsat video services. You will note, as I did, that the majority of the services are not yet scrambled and indeed **may not** scramble for some time (**if ever**). This of course provides a glimmer of hope for a European (11GHz) home TVRO industry since very few countries in Europe have more than 4 (and most have fewer than 4) local (terrestrial) TV services.

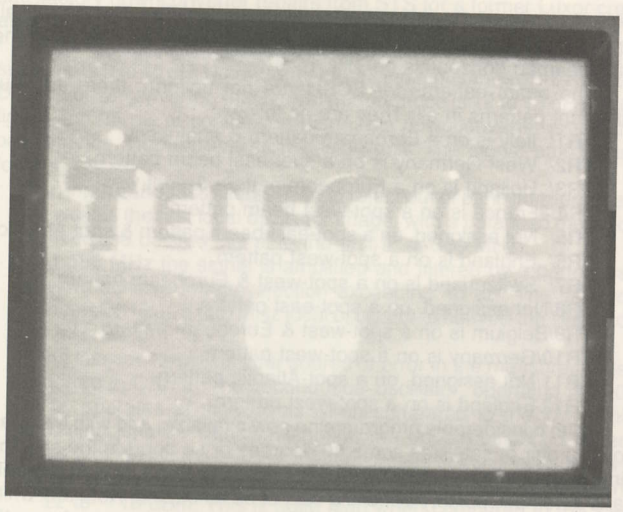
His data follows:

ECS-1: (43.5 dBw EIRP 'typical' into the south of England)

TR1/ Leased by Italy and in use 1100-0100 GMT daily. Uplink from Fuchino, 28 MHz bandwidth video with audio subcarrier of 6.6 MHz.

TR/2 Leased by West Germany and programmed with German ZDF and Austrian ORF from 1700 to 2400 GMT daily. 26 MHz bandwidth, audio is sound in syncs (**not** sub-carrier).

TR3/ Leased by Holland, operated privately with August start-date scheduled from 1600 to 2300 GMT daily. Technical details not pre-announced.



TELECLUB/ German language movies uplinked from Switzerland on ECS-1, TR7.

TR4/ Leased by France and operated as 'TV5' with programming supplied by TF1, TF2 French networks plus RTB (Belgium) and SSR (Switzerland). Operates 1800-2100 GMT daily, 30 MHz bandwidth and audio carried on 6.6 MHz sub-carrier.

TR5/ No use announced.

TR6/ Leased by United Kingdom and operated as 'Sky Channel,' the Murdoch advertising supported pay-TV service. Operates 1700-2400 GMT daily, (Oak) scrambled.

TR7/ Leased by Switzerland, operated by 'Teleclub' with German language movies 1700 to 2300 GMT daily. 28 MHz bandwidth, 6.6 MHz sub-carrier audio.

TR8/ No use announced.

TR9/ Leased by Belgium, no actual user announced.

TR10/ Leased by West Germany, operated by PKS (Public Kabel Service) with movies and news 1700 to 2400 GMT daily. 26 MHz bandwidth, sound in syncs audio.

TR11/ No use announced.

TR12/ Music Box, 'pop video' service was due to start around 1 July. Technical details not pre-announced.

Meanwhile, on Intelsat V at 27.5 west there is spot beam service with EIRP levels in the 45 dBw region into the UK on 11 GHz (actually the high end of 10 GHz and the low end of 11 GHz since none of the present birds are actually in the 12 GHz allocation region). This is broken up into vertical, and horizontal, transponders similar in concept to the North American domestic birds. The present users are as follows:

SCREEN SPORT/ The 'ESPN' for Europe occupies lower (half) **transponder** (TR3) **of Intelsat V.**

TR1/ (horizontal polarization) 'Jack In The Box' (children's programs) in the afternoon hours, 'Premier Films' in the evening hours (was scheduled to start in July).

TR3/ (horizontal polarization). This channel is run in a split transponder format with 'Screensport' (ESPN of Europe) in the lower half from 1700 to 2300 GMT daily, using a 30 MHz bandwidth and a sub-carrier audio on 6.6 MHz. In the upper half is TEN (The Entertainment Network) with feature films from 1600 to 0100 GMT daily. The format is 30 MHz bandwidth and a sub-carrier at 6.6 MHz.

Transponders 1 through 6 are horizontal and are leased from Intelsat by British Telecom who in turn re-leases their use to the cable program suppliers. Transponders 7 through 12 are vertical, and they

have been leased by Mercury Communications. The 7 - 12 (vertical) transponders are reported to be 2 to 3 dB lower in level than the spotbeamed horizontals on TRs 1 - 6.

The beam patterns for **ECS-1** are not uniform; there are four different patterns in all. They are as follows:

TR1/ Italy is on a Eurobeam pattern & spot west.
TR2/ West Germany is on a spot-east beam pattern.
TR3/ Holland is on a Eurobeam pattern & spot west.
TR4/ France is on a spot-west beam pattern.
TR5/ Not assigned, on a spot-east beam pattern & spot Atlantic.
TR6/ England is on a spot-west pattern.
TR7/ Switzerland is on a spot-west & Eurobeam pattern.
TR8/Not assigned, on a spot-east pattern.
TR9/Belgium is on a spot-west & Eurobeam pattern.
TR10/Germany is on a spot-west pattern.
TR11/Not assigned, on a spot-Atlantic pattern.
TR12/England is on a spot-west pattern.

With considerable programming now available, and with it spread over a pair of satellites some 40 degrees or so apart in the sky, the interest in TVROs is growing rapidly in Europe. Motor driven terminals and automatic polarity switching cannot be far behind! Note that while the 6.6 MHz sub-carrier audio seems quite standard, **several are still using** the sound-in-sync(s) approach which requires a special decoder box.

Our thanks to Michael Stone for the update, and our suggestion that those readers in Europe and North Africa would do well to check with Stone concerning their (11GHz) receiver needs from a European manufacturer-supplier.

TEN/ The Entertainment Network with premium movies on upper half of TR3, Intelsat V.

Feedback: STS MBS-SR Receiver

In **CSD/2** for June 15th, we reviewed the apparent performance of the **STS** model **MBS-SR** receiver, pointing out to readers that the downconverter tests reflected a downconverter which was not operating very well. We drew this to the attention of **Ed Horton,** President of Satellite Technology Services, and discussed with him how one could come to the measured-conclusions we found using standard and accepted test equipment. We asked Horton to prepare a response to the June 15th review since, as he points out in the material to follow, we did not have 'pictures' that would seem to verify a downconverter with noise figures in the 25 dB region and gains in the 10 dB region.

Horton reflects on how a frequency oscillator, designed to provide the requiring mixing action to step the 3.7 to 4.2 GHz incoming signal down to a more manageable lower 'IF', can 'fool' the Hewlett Packard 8970A noise figure test set and create erroneous noise figure (and he suggests 'gain') readings. He also reflects on a 'CSD/2 Feedback Letter' appearing in the same June 15th issue which described the frustrations of New Mexico TVRO dealer Henri Guerin with obtaining

satisfactory downconverter repairs from STS for a former Luxor created (and STS distributed) receiver package.

"Your CSD/2 tests reported a noise figure of 25 dB and a conversion gain of 9 to 10 dB. I know, after producing thousands of this model DC-102 downconverter, that typical performance is 12 to 13 dB noise figure and 25 dB of conversion gain. This downconverter is a high performance, **dual-conversion** design unit. The signal path is as follows:

"An input bandpass filter is used to reject out of band interference, as well as the first local oscillator image, with a balanced mixer to convert the desired signal to the first IF of 550 MHz;

"**At 550 MHz** the signal is amplified and filtered by a bandpass filter to achieve image rejection exceeding 40 dB. The second conversion uses a 620 MHz local oscillator to convert the signal to 70 MHz;

"The last conversion is your source of error in the measurements reported in CSD/2. The second local oscillator, operating at 620 MHz, operates at high levels when compared to the low level incoming satellite signals. Although the double balanced mixer does provide local oscillator attenuation, the second local oscillator will appear at the 70 MHz IF output port at a level of between −22 to −18 dBm. This is quite high when compared to the low signal levels under test.

"The 'other signal(s) in this case come from the HP346B noise source with excess noise of about 15 dB above the thermal level of −174 dBm/Hz. The noise bandwidth of our downconverter filter is approximately 59 MHz. While the 620 MHz local oscillator is filtered out within our receiver and should cause no problem, **it will corrupt the measurement of the noise figure meter.** If you will examine the noise figure meter block-diagram provided by Hewlett-Packard and their product note 8970A-1, you will see that this system uses a lowpass filter with a cut-off of 1500 MHz. This filter is the ONLY selectivity prior to the input power detector used by the microprocessor to control the input attenuators. A high level 'spurious signal' (such as the local oscillator signal at 620 MHz) into the input will be detected if it is below 1500 MHz since a broadband detector is used. In effect, the microprocessor 'looks at' the 'wrong signal'!

"Your reported low gain measurement of 12 to 13 dB is consistent with this type of error.

"**In the 12 years** that I have been involved in the design of sophisticated communication systems, I have learned to check my measurements whenever there is a suspicious result. Surely a 25 dB noise figure and a 10 dB conversion gain should have appeared suspicious to you since you received acceptable video.

"A second noise figure measurement using a Spectrum Analyzer could have been made. The H-P application note 150-4 ('Spectrum Analysis ... Noise Measurement') is an industry standard and correctly defines the process, although it is not as accurate as the 8970A test. Still, it would have been a good way of checking your own 8970A measurements. At the very least, a simple conversion gain measurement could have been performed.

"While no manufacturer can assure the customer of 100% defect free performance, we are trying to build the best equipment possible. Each downconverter is burned in prior to final testing, which is performed on an H-P 8755P automatic scalar network analyzer. Items tested are gain, gain-flatness and image rejection. Second local oscillator frequency and level are checked by HP5342A-OPT002 counters. Of course each downconverter must pass all tests before it is shipped from our facility.

Finally, as an aside, one of the dealers writing in CSD/2 Feedback in the June 15th issue said he could not obtain service for our DC-102 downconverter through Luxor North America, since the dissolution of the distribution agreement. If this is true, I can only apologize for the information he received from Luxor service. We make it a practice to repair or replace any downconverter returned to our facility, within 48 hours. If Luxor service finds a defective DC-102, it is returned to STS for warranty repair where it is quickly and accurately repaired. Anyone not receiving the proper attention from Luxor should feel free to send the downconverter directly to STS for prompt attention.

"Thank you for the time spent with our products."

COOP/ continues on page 92

Satellite Financial Planning brings Bank Rate Financing on home TVRO systems.

...Another Bill Young Company!

...the Most Complete Three Year Extended Limited Warranty Protection Plan. (Only Four Exclusions) Convenient, Just Call 1-800-932-DISH To Place Your Credit Order

$200 BONUS
TO DEALERS WITH FINANCING AND EXTENDED WARRANTY PACKAGE.

- 100% Financing—No Down Payment!
- 24 Hour Credit Approval in Most Cases.
- Flexible Payments—Revolving Payment Plan 36—48—60—72 Months or LONGER.
- Bank Rate Financing Available Less Than 16.99%*
- Complete Three Year Extended Limited Warranty Protection Package (Only Four Exclusions).

For more information please call Monday thru Saturday 9:00 a.m.-8:30 p.m. EST or send in coupon

Call Toll Free 1-800-932-DISH—All 48 States. In Canada call (301) 964-1990 or 964-1991

FINANCING FIRST NATIONAL BANK OF WILMINGTON AND AFFILIATES

The extended limited warranty and protection plan provided by Satellite Earth Station Association Company, Inc. is underwritten by RELIANCE INSURANCE COMPANY.

Dealers...

NOW FOR THE FIRST TIME YOU CAN

Start!

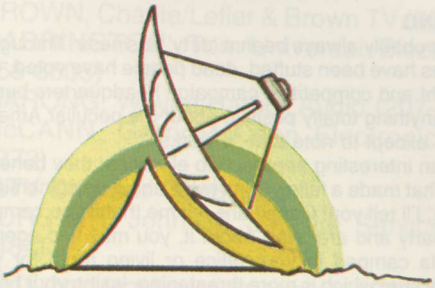
EFFECTIVE MARCH 1, 1984
"WARRANTY NOW OPTIONAL"
"The Extended Warranty Protection Plan is now completely optional. Loans for TVRO systems and other electronic equipment are available, independent of the Warranty coverage."

ADVERTISING 100% BANK RATE FINANCING* PLUS ALL PARTS & LABOR GUARANTEED FOR THREE YEARS.**

- No Down Payment
- No Collateral Needed
- Up To 6 Years and Longer Repayment Period
- Flexible Payments***
- Low Monthly Payments****
- No Complicated Paperwork*****
- All Current TVRO Equipment Covered Under The Warranty Program

*RATE AS OF OCTOBER 5, 1983.

***Upon Approved Credit**
*****Customer Can Change Mode of Payment Without Penalty**
****\$40.00 Deductible — See Sample Warranty**
******Illustration: A Typical $2500.00 System with 3 Year Warranty —$65.50 Per Month**
*******Simply Dial 800-932-DISH Instantly Starts the Credit Approval Process**



SATELLITE FINANCIAL PLANNING CORPORATION
1000 Century Plaza, Suite 320
10630 Little Patuxent Parkway
Columbia, Maryland 21044

SATELLITE FINANCIAL PLANNING CORPORATION
1000 Century Plaza, Suite 320
10630 Little Patuxent Parkway
Columbia, Maryland 21044

Please send me information regarding financing and extended limited warranty for the home TVRO user.

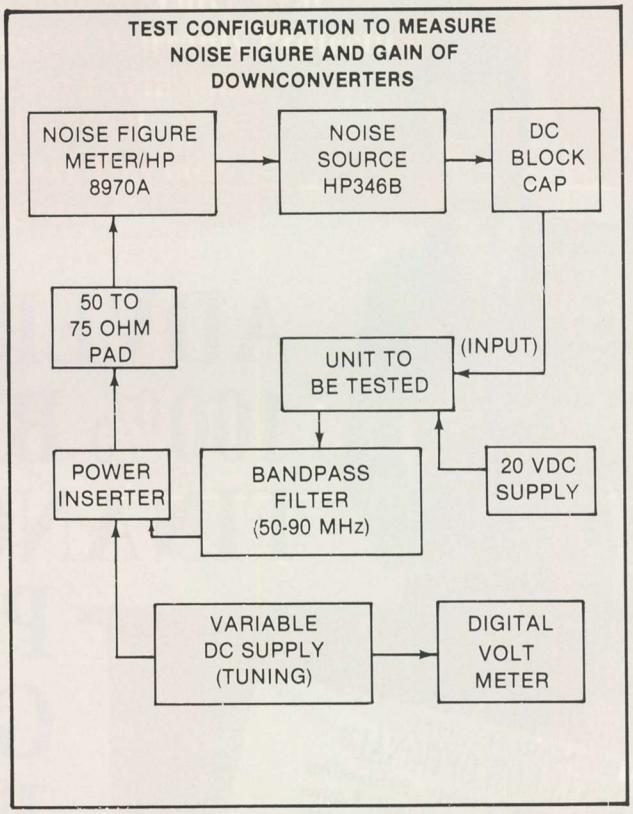
Name _____ Telephone( ) _____

Address _____ City _____

State _____ Zip Code _____

COOP/ continued from page 89

We appreciate Ed's time in spelling out the testing sequence for us. A suitable solution, for such testing, would be the addition of a bandpass filter to eliminate the unwanted high(er) level oscillator signal from the measurement system input to the 8970A. **This is shown here** in illustration form.



TEST SYSTEM employed with addition of bandpass filter recommended.

Of course a 25 dB noise figure **is unusual,** as is 10 dB of conversion gain. However, tests conducted with nearly a dozen receivers by CSD last summer revealed that **several** production units we tested **were operating** with downconversion noise figures **in excess of** 25 dB and gains of **around 10 dB.** Such numbers are clearly indicative of poor performing receivers, but they also are not **that** uncommon either. **Dealers who experience** unusually poor reception with any 'name-brand' receivers would always do well to break open another receiver box to **try an alternate downconverter** as a 'first level fix' to the problem. Maximized receiver performance has always begun with a well working downconverter, and a poorly designed or poor operating downconverter will never produce quality pictures.

ELECTIONEERING

Politics has probably always been a 'dirty' business. Through the years ballot boxes have been stuffed, dead people have voted, votes have been bought and competitive campaign headquarters burgled. It's hard to say anything totally positive about the peculiar American election process except to note that "it works."

France had an interesting approach to elections; they beheaded the opposition. That made a fellow think twice about being nominated to the opposition, I'll tell you! Canadians tell me that if you campaign for 'the wrong' party and are overt about it, you may find agents of Revenue Canada camped in your office or living room for years thereafter. I'm not sure which is more threatening; losing your head or spending years fighting with the tax people.

We've never had a **real election situation** in the TVRO industry before. This is a first. So far nobody has been beheaded, and nobody

has been visited by IRS agents. But we still have 30 days or so to go.

In this section this month there appears a list of 22 names. These are the poeple who have been identified with progressive reform of SPACE. They call themselves **'Friends Of SPACE'** and as I note separately, here, this particular journalist is not on the slate. Nor am I on the ballot. The only way I could get elected as a representative of the dealers would be if there was a tremendous grass roots effort to

---

FRIENDS OF SPACE ENDORSED CANDIDATES

The following 22 people have been endorsed by the **Friends Of SPACE** coalition as candidates for the SPACE Board of Directors. We publish this list as a public-service to help those who might be confused by the claims and counter-claims being circulated ahead of the SPACE election process. Not ALL of those listed here necessarily endorse the Friends Of SPACE 'slate' as a 'running group' but **all** listed here at least **privately endorse the progressive reform of SPACE** and what Friends Of SPACE stands for. If you are a voting member of SPACE, you will be asked to select from the many candidates listed on your ballot an appropriate number of individuals whom you would like to see representing you on the board. Ballot information may not clearly identify those who are a part of the Friends Of SPACE 'slate.'

Manufacturer Director Candidates:

DAVIS, Guy/Uniden (714-898-0576)
DEHNERT, Doug/USS — United Satellite Systems (218-681-5616)
GINER, Hans/Luxor North America (206-451-4414)
GROTSKY, Ed/Arunta (602-956-7042)
JOHNSON, David/Paradigm Mfg., Inc. (916-365-9131)
JONES, George/Conifer (319-752-3607)
MOORE, Jerry/Dexcel-Gould (408-943-9055)
SMITH, Bruce/M/A-COM (603-424-4111)
WARD, Brian/Electrohome (519-744-7111)
(plus 3 yet to be announced)

Distributor Director Candidates:

COX, Tom/Cox Enterprises (615-354-3471)
HEBERT, Rick/C.S.E. Satellite Equipment (514-562-3751)
KISTINGER, Gary/Satellite Video Services (518-678-9581)
LEAF, Stan/SRC Industries (503-889-7261)
SCHROEDER, Mike/Consumer Satellite Systems (317-254-1776)
SWARTZ, Larry/Vess Distributing (703-254-1776)

Dealer Director Candidates:

ANDERSON, Keith/Skytronics (602-956-1977)
BERKOFF, Ed/20th Century Satellite (416-883-3150)
BROWN, Charlie/Lefler & Brown TV (309-289-2829)
HARRINGTON, Tom/Universal Electronics (614-866-3605)
MARONG, Wayne/Harbor Audio (207-236-3640)
McCANN, Gerry/McCann Electronics (504-837-7272)

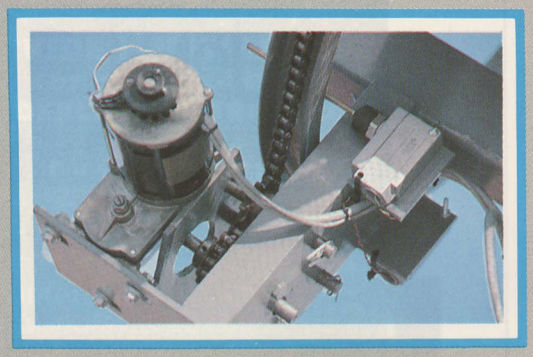
SMATV Director Candidate:

FORSTER, John/US Satellite Services (612-340-0484)

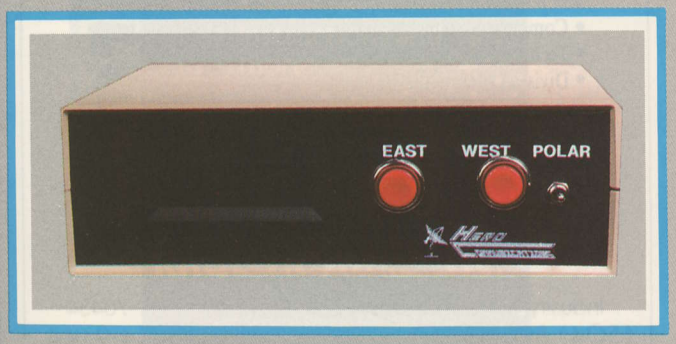
NOTE: **bold face** listings are presently SPACE directors.

THE HIGH

A.

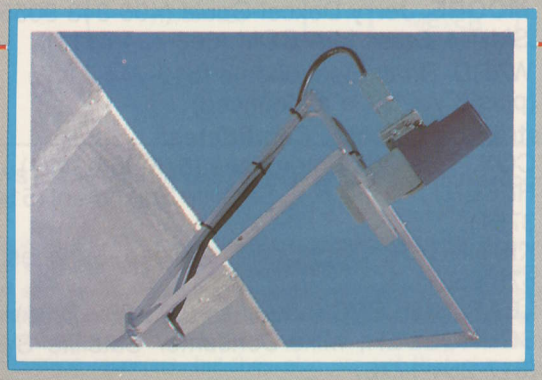


B.



THE HERO 13 is a full foot larger than the tinker-toy 12 footers. It has strength no tinker-toy antenna ever had, and performance that runs 'rings around the toy like competition! A full foot bigger — a fat 1 dB more gain than the best of the 12 footers. And complete; a horizon to horizon motor drive (your customer's won't miss the new F2R, G2, birds with a Hero antenna!) that brings in true world-class pictures from the FULL arc! Dealer friendly. A complete install kit; special drills, tools are packed with each antenna. You need NOTHING but a 1/4'' hand drill, screw driver, and adjustable wrench. Everything else is included. MOTOR DRIVE, digital read out control (with built in Polarotor control) and a self-proofing feed; it checks itself and you KNOW you have maximum gain! No cables to prepare; our MASTER CABLE has all connectors in place; everything 'snaps together' in record time! You can actually install a HERO 13 as fast or faster than the tinker-toy 12 footers.

A. Horizon to horizon motor drive. (uncovered)
B. HERO digital remote control antenna positioner.
C. Adjustable feed and LNA mount.



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*The HERO 10 ft. and 13 ft. system includes: antenna • polar mount • horizon to horizon motor drive • digital remote control box • 100 ft. of cables with connectors • electromechanical limit switches.

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COOP/ continued from page 93

get me on the ballot as a 'write-in' candidate. I don't look for that to happen, and stand on my separate comments as to why I chose not to be on the ballot.

Some of these 25 people **are afraid to be identified** with Friends Of SPACE. Before it is all over, I suspect others will be intimidated because they agreed to run as a part of the 'Friends' slate. I had a call from a distributor on the list. He was first **asked** not to run as a member of the slate. He stood his ground. Then he was **told** that IF he chose to run, he would no longer be sold a certain brand of product. The guy on the other end of the line was a manufacturer on the present board of directors. He wanted to behead the nominee's pocketbook by cutting off his supply. Not very subtle.

Usually when a group such as Friends Of SPACE forms, you look for the jugular vein; the one artery that if cut would cause massive bleeding. There is none because Friends Of SPACE is a true 'grass roots' coalition. A few of those working on this effort are more visible than others, but **there is no leader here.** That's good. That's also the primary reason **I** backed out of running myself; **I** was too easy a target as a jugular vein. Even Chris Schultheiss knew where to find **that artery** and he's not even a doctor. So to upset the 'FOS' applecart, the opposition is resorting to putting direct pressures on those who are on the slate. If you can't find **one** main artery, you attack **25 individual veins.** Some will escape this process. Most will not. There will be more threats, more intimidation, and more semi-dirty-tricks. I'll have a great deal of fun reporting them to you in the months ahead. **And I'll name names when it is all over.**

Once **I** had made the firm decision to stay off the slate, I also lost the right to directly impact the selection of the slate members. The grass roots coalition did this in what I believe to have been a democratic, painful search for the **best people** the industry had to offer. I talked at length about this with present SPACE Chairman David Johnson when he was down to Provo late in June. **Johnson spoke his mind** in our **July 15th** edition of **CSD/2.** He knew he was going to get plenty of heat from both the present board and probably many others for revealing his own perspective on the way SPACE affairs are managed. What he said in **CSD/2** made it very plain to me that Johnson has alot of guts. After we sat in the TV studio and talked the interview through for several hours, recording our conversation, I sat down and did a first draft of the conversation. It would have run to more than 20 pages in print. Obviously some material had to be eliminated.

We both agonized over what to eliminate and what to keep and then a second draft was prepared. Now he sat down and went through it word for word to make sure **it said** what **he said,** and that it left no room for those named to wiggle out of their alleged mis-deeds. He had with him a substantial stack of SPACE top-level paperwork which he would refer to on his lap as he went through the interview again and again. I never asked to look at it since he had it only because **he** was Chairman of SPACE, and **I** was a journalist had no business seeing it.

Every now and again, however, he'd hand me a sheet and tell me to read over a specified paragraph or two. I would, and then I handed it right back. I admired him for being so thorough that he wanted every i dotted and every t crossed in the interview.

I think I will be even more disappointed than David Johnson **if he is not re-elected to the board.** He is an honest, caring person who has suffered considerable personal anguish because of the sorry state of SPACE affairs this past year. He is, however, running in a tough league; the SPACE 'pioneer league.' Those are the big boys and some of them would just as soon behead you as sell to you. Many will be fearful that Johnson is 'not to be trusted' with the keys to the executive men's room if he has such high moral values. It is a strange, sad commentary on business ethics that those often most admired by their cohorts are those who live by the sword.

The election results will be announced in Nashville. I hope they do it up big and release those results ONLY through the mouth of a certified public accountant and then ONLY when all of the membership is on hand to hear the results. When it's all over remind me to tell you about the proposal from a certain law office in Washington, DC which would have expanded the SPACE Board to 35 people so 'Friends Of SPACE' could have **ten** seats **of their own,** and, the present 25 could continue in office!

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